THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LV. No. 1400.] LONDON, MARCH 11, 1890. [42ND YEAR. Price 6d.

Ashmore, Benson, Pease, & Co., Ltd.

GASHOLDERS.
CONDENSERS.
SCRUBBERS.
PURIFIERS.
RETORT-APPLIANCES.
CONSTRUCTIONAL IRONWORK.
DAVIS'S AMMONIA STILLS.

STOCKTON-ON-TEES.

Illustrated Gas-Works Catalogue.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

WOLSTON'S
TORBAY PAINTS
Special Quotations to Gas Companies.
23, GREAT GEORGE ST., WESTMINSTER, S.W.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.

Office: 7, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

C. & W. WALKER.

GASHOLDERS; PURIFIERS;
PURIFYING MACHINES;
CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;
SULPHATE & SULPHUR PLANT;
RETORT MOUTHPIECES; CONDENSERS;
LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;
SLIDE VALVES; TAR BURNERS; &C. &C.
WOOD SIEVES.

ADDRESSES: 8, Finsbury Circus, London, E.C.; Midland Iron-Works, Donnington, near Newport, Shropshire.

"FORTRESS LONDON." "FORTRESS DONNINGTON."—Telegraphic.

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMER'S WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE & EXHAUST REGISTERS, TEST HOLDERS,

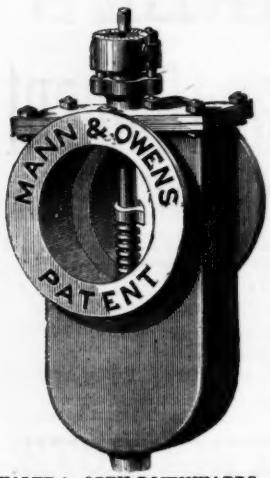
And all kinds of Experimental Gas Apparatus.

S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

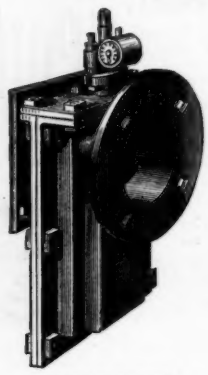
SOLE MANUFACTURERS OF

MANN & OWENS' PATENT SCREW & CAM, also FULL-WAY RACK & PINION GAS-VALVES.

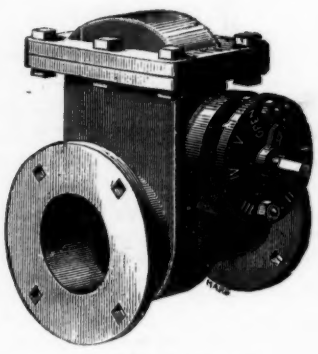
REDUCED IN PRICE.



VALVE to OPEN DOWNWARDS.



BRIDGE VALVE
for Regulating the Seal
of Hydraulic Mains.



FULL-WAY RACK AND
PINION VALVE.

VALVE to OPEN UPWARDS.

Also Makers of Pillar Valves, Self-acting Bye-pass Valves, Outside Rack and Pinion Valves, Hydraulic Main-Valves, Disc-Valves, and Special Valves of all kinds. Improved Gas-Exhausters, Steam-Engines, Steam-Cranes, Boilers. Blake's Patent Steam-Pumps for Tar, Water, and Ammoniacal Liquor, Hydraulic Coal-truck Lifts, Hydraulic Cranes, Hydraulic Apparatus for Lifting Purifier-Covers, and every description of Pumping Apparatus, &c., suitable for use in Gas-Works, made to order.

S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

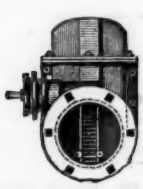
MANUFACTURERS OF

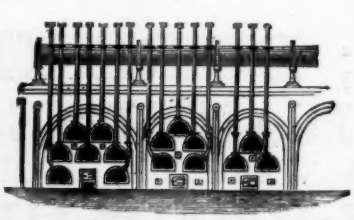
SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.
GASHOLDERS,
AND
Gasholder Tanks.

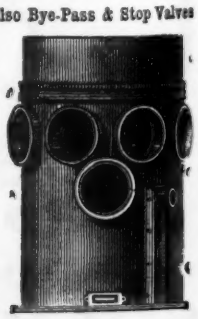
CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates
and Tools, &c.

WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves





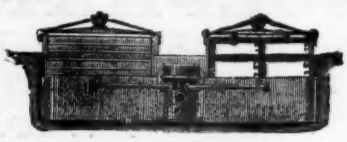


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

THE BARROWFIELD IRON-WORKS, LIMITED,

Late LAIDLAW, SONS, & CAINE, Limited,

GAS ENGINEERS AND CONTRACTORS,

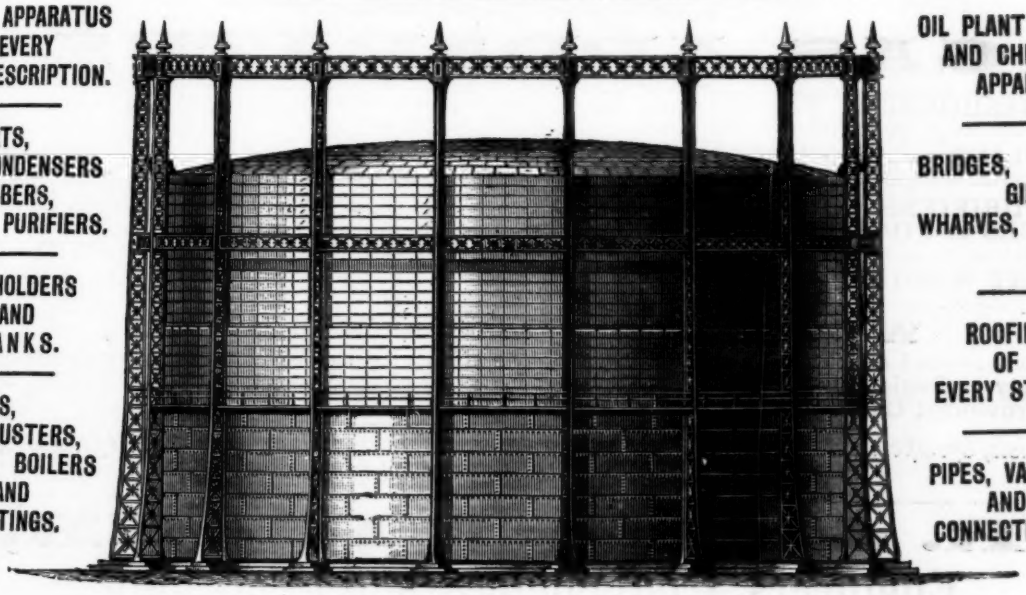
Telegrams: "GASOMETER GLASGOW." GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.



OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

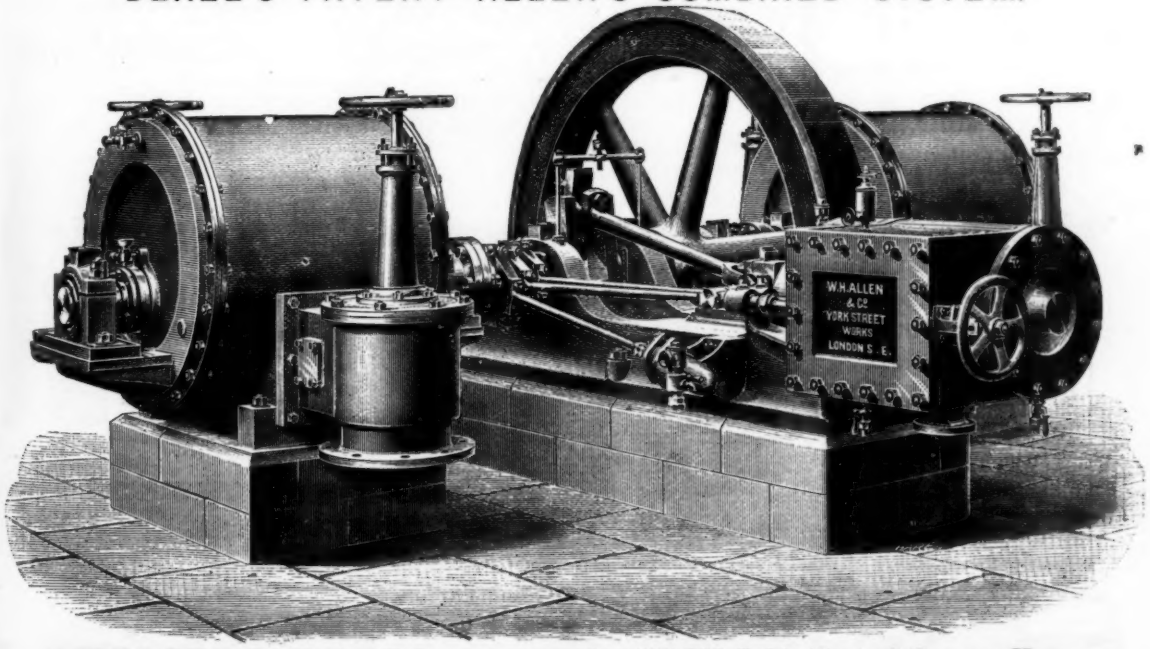
W. H. ALLEN & CO.,

York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

WILLEY & CO.,

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.
London Offices: 6 & 7, KING WILLIAM STREET, E.C.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

MANUFACTURERS AND BUILDERS OF

SULPHATE OF AMMONIA PLANTS,

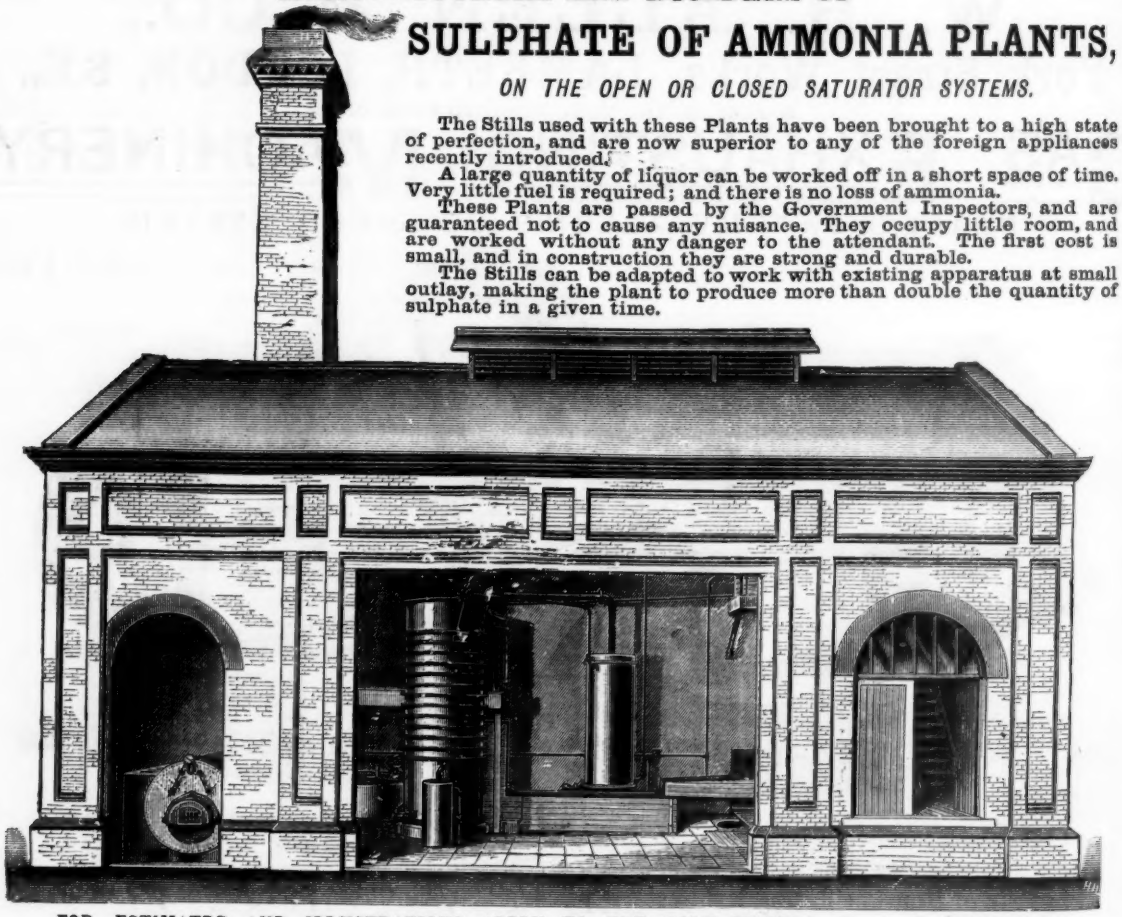
ON THE OPEN OR CLOSED SATURATOR SYSTEMS.

The Stills used with these Plants have been brought to a high state of perfection, and are now superior to any of the foreign appliances recently introduced.

A large quantity of liquor can be worked off in a short space of time. Very little fuel is required; and there is no loss of ammonia.

These Plants are passed by the Government Inspectors, and are guaranteed not to cause any nuisance. They occupy little room, and are worked without any danger to the attendant. The first cost is small, and in construction they are strong and durable.

The Stills can be adapted to work with existing apparatus at small outlay, making the plant to produce more than double the quantity of sulphate in a given time.



FOR ESTIMATES AND ILLUSTRATIONS, APPLY TO THE SOLE MAKERS, R. & J. DEMPSTER.

PATENT GLASS LAMPS & COVERS

For Streets, Railway Platforms, &c., &c.

(Patented the 4th of May, 1889.)

This Lamp and Top, being made entirely of Glass, is perfectly impervious to corrosion, and therefore invaluable in Manufacturing and other Towns. The Top can be had in clear or coloured Glass; and is much cheaper than the old style of metal frames. The New Lamp can be adapted to the old metal frame top.

Prices on application.

PILKINGTON BROS.,
Glass Works, St. Helens, Lancashire.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON"	BECK & Co.
MARK.	CLAY CROSS.	53, QUEEN VICTORIA ST., E.C.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations:—

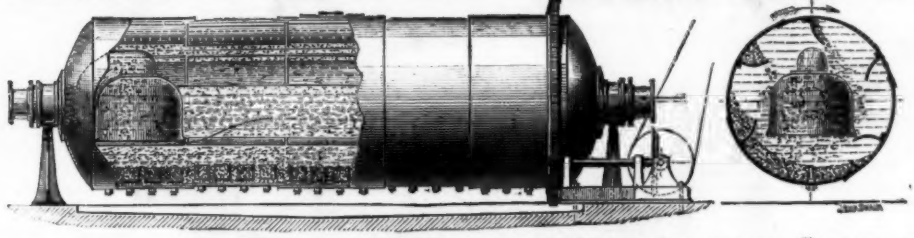
ILKESTON.	BURY.	CHORLEY.
WIDNES	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

THE REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY. REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

☛ GOLD MEDAL, INVENTIONS EXHIBITION, 1885. ☚

Revolving Purifier Company, Limited,

DOCK HOUSE, BILLITER STREET, LONDON, E.C.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

LONDON OFFICE, 60, QUEEN VICTORIA ST., E.C.

CLAYTON SON & Co LIMITED, LEEDS.

MAKE

RETORT LIDS

OF ALL FORMS & SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

F. & C. OSLER,

(ESTABLISHED 1807)

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,

TABLE GLASS OF ALL KINDS,

CHANDELIERS IN BRONZE AND ORMOLU.

MODERATOR LAMPS.

100, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS,

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

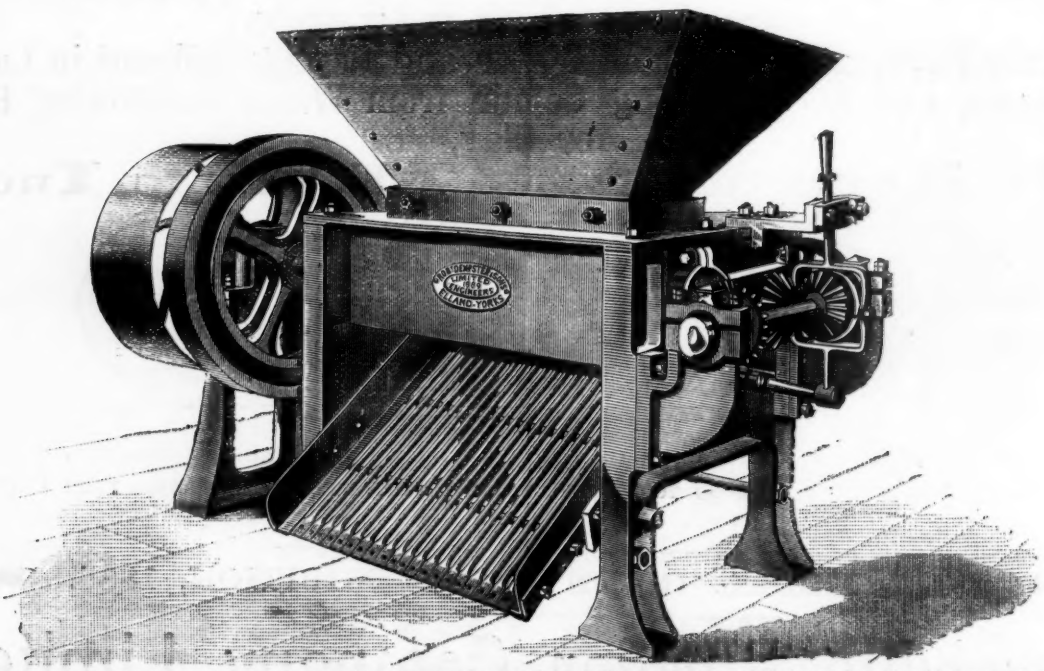
SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES

153 TO 155, CANNON STREET, LONDON BRIDGE, E.C.

R. DEMPSTER & SONS, Ltd.,

ROSE MOUNT GAS ENGINEERING WORKS,

ESTABLISHED — ELLAND. — 1855



The above illustrates our IMPROVED COKE-BREAKING MACHINE, which is capable of breaking upwards of 30 Tons of Hard Coke in 9 hours, with a minimum make of Breeze. It is adapted for Breaking the Coke to any required size.

For Prices and further Particulars, apply to DEMPSTERS', ELLAND.

W. & B. COWAN'S DRY METERS.

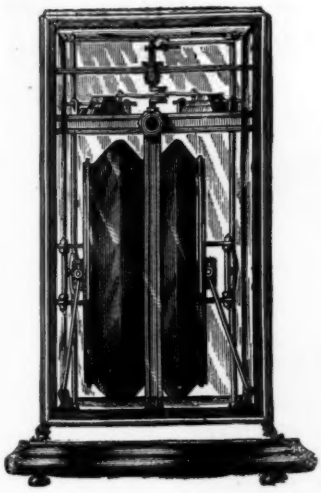
Outside Dimensions.

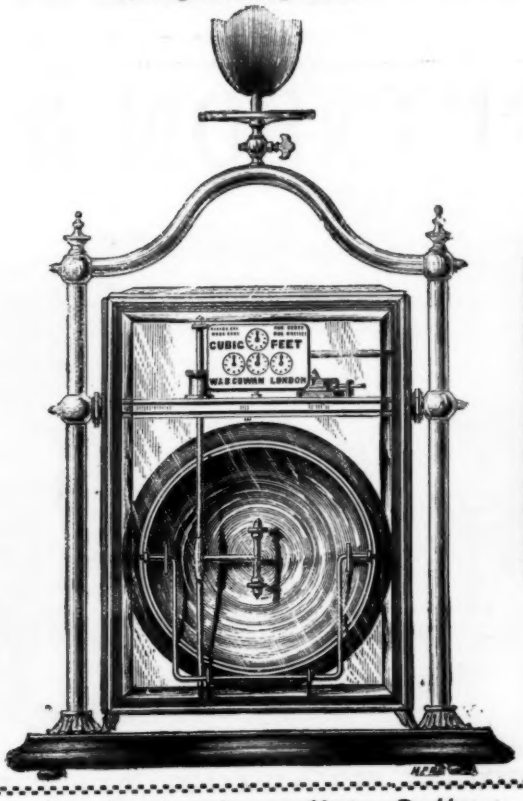
Size.	Depth, Back to Front.	Height, including Unions.	Width, including Unions.
Lights.	Inches.	Inches.	Inches.
2	7¼	13¾	10
3	8⅝	15	11¼
5	9½	16¾	13
10	10¾	19	15
20	13¼	24½	18½
30	16⅛	27½	21¼
50	20¼	33¼	26
60	21	33½	27
80	24¼	40½	31
100	25½	42¼	33¼
150	27¾	50¾	42
200	30	56¾	42¾
250	34¼	58	46¼
300	38¼	63¼	49¼
400	41¾	72¼	56¼
500	46	74	57½

150 Lights and upwards.

Measuring Capacity.

Size.	Bore of Inlet and Outlet.	Per Revolution.	Per Hour.
Lights.	Inches.	Cub. Ft.	Cub. Ft.
2	½	0·083	12
3	⅝	0·125	18
5	¾	0·160	30
10	1	0·3	60
20	1¼	0·5	120
30	1⅜	0·830	180
50	1½	1·428	300
60	1¾	1·6	360
80	2	2·5	480
100	2	2·857	600
150	3	5·0	900
200	3½	6·6	1200
250	3½	7·3	1500
300	4	8·3	1800
400	5	12·0	2400
500	5	14·285	3000





2 to 100 Lights inclusive.

Large Stocks always Ready for Immediate Delivery or for Shipment.

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER, LONDON, S.W. | DUTTON STREET WORKS, MANCHESTER. | BUCCLEUCH STREET WORKS, EDINBURGH.

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725

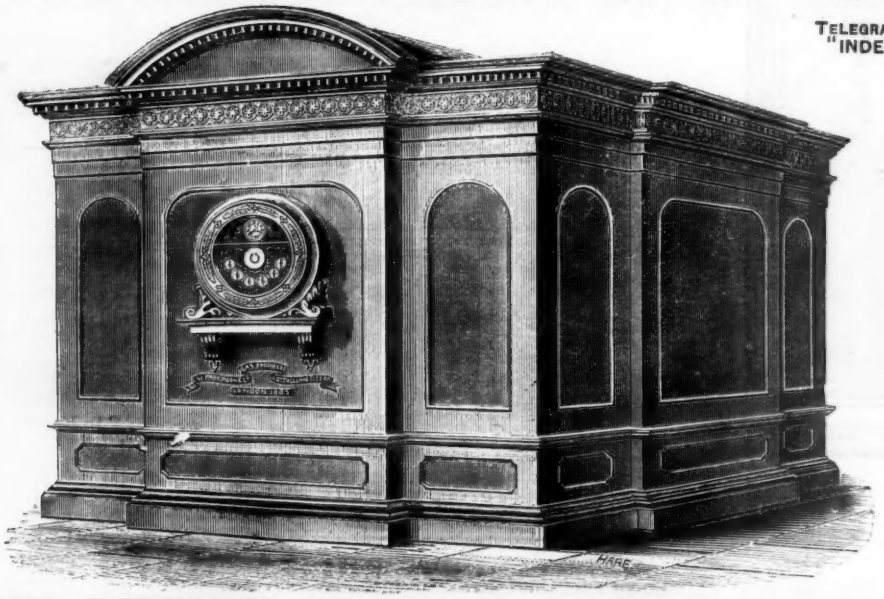
1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

W. PARKINSON & Co.,

COTTAGE LANE WORKS, CITY ROAD, LONDON.

TELEGRAPHIC ADDRESS: "INDEX LONDON."



NEW DESIGN STATION METER (No. 2 PATTERN).

W. PARKINSON & CO. have introduced the above design of Station Meter in order to meet the demand for a more ornamental Tank. It is simpler in construction than No. 1 Pattern, and consequently less in cost. All joints are planed, the most modern improvements introduced, and the entire Meter is of the strongest and most substantial description.

FITTED WITH

PARKINSON'S PATENT THREE-PARTITION MEASURING DRUM.

MATERIALS and WORKMANSHIP of the VERY BEST QUALITY ONLY. PRICES, &c., ON APPLICATION.

Highest Award, Melbourne Exhibition.

[See also Advt. p. 488.

CONTENTS.

EDITORIAL NOTES:—

GAS LIGHTING, &c.— PAGE

The Gas Institute and the New Institution . . . 429
The Condition of the Coal Trade . . . 430
The Gas Supply of Birmingham . . . 430
Patents and Trade Secrets . . . 430
Coal in Kent . . . 431

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market . . . 431
Electric Lighting Memoranda . . . 431
Alfred Penny . . . 432
Thomas Wrake Ratcliff . . . 432
Engineering Honours . . . 433
Electrical Engineering . . . 433

NOTES:—

Cause of the Failure of Carburetted Wood Gas . . . 434
The Stability of Walls . . . 434
Mr. Aitken's Further Researches on Atmospheric Dust . . . 434

COMMUNICATED ARTICLE:—

The Chemistry of Illuminating Gas. By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S. . . . 435

TECHNICAL RECORD:—

Manchester District Institution of Gas Engineers—The Annual Meeting in Manchester—
Supplementary Paper by Mr. Isaac Carr on the Dinsmore Process . . . 436
Statement by Professor Watson Smith . . . 437
Discussion on Mr. Carr's Paper . . . 439
Inaugural Address of Mr. W. W. Hutchinson (*conclusion*) . . . 441

REGISTER OF PATENTS:—

Applying Gas Engines for Intermittent Work—Piers, E. F. . . . 443
Liquid Meter—Ahrbecker, H. C. . . . 443
Heating Gas Retorts—Bamberg, G. . . . 443
Manufacture of Water Gas—Fox, S., and Blass, E. . . . 443
Gas-Engines—Rogers, W., and Wharry, J. A. . . . 443
Pipe Joints for Subaqueous Use—Brown, O. . . . 444
Meters for Liquids—Bonne, C. R. (Meinecke, H.) . . . 444
Manufacture of Fuel and Lighting Gas—Newton, H. E. (The Fuel Gas and Light Improvement Company) . . . 444
Patent Notices . . . 444

CORRESPONDENCE:—

Mr. Methven's Paper on "Photometry" . . . 444
The Day of Reckoning . . . 445

PARLIAMENTARY INTELLIGENCE:—

House of Lords—Progress of Bills . . . 446
House of Commons—Electric Lighting Provisional Orders; Inspection of Reservoirs; Progress of Bills . . . 446

LEGAL INTELLIGENCE:—

Westminster County Court—Robinson and Fisher *v.* Satchell and Others . 446
Pontypool Police Court—Alleged Impurity of the Pontypool Water Supply . 446

MISCELLANEOUS:—

The Directors of the South Metropolitan Gas Company and their Workmen—Presentation at the Vauxhall Station . . . 447
Crystal Palace District Gas Company—The Half-Yearly Report . . . 447
Provincial Gas and Water Companies . . . 447
The Salford Gas Scandal—The Proposed Commission of Inquiry; The Consultative Committee's Report . . . 449
Birmingham Corporation Gas and Water Supply—Committee's Annual Report . . . 449
Batley Corporation Gas Supply . . . 451
The Canterbury Corporation and the Gas and Water Company—The Proposed Purchase of the Works; The Petition against the Company's Bill . 451
The Johannesburg Gas Undertaking . . . 451
The Extensions at the Leigh Gas-Works . . . 452
The Public Lighting of Wimbledon . . . 452
Meeting of the City of St. Petersburg New Water-Works Company, Limited 452
Notes from Scotland . . . 453
Current Sales of Gas Products . . . 454
Gas and Water Companies' Stock and Share List . . . 454

PARAGRAPHS.—Mr. Alfred J. Hope, 432—Bay State Gas Company of New Jersey, 432—The American Export Petroleum Trade for 1889, 432—The George Livesey Testimonial Fund, 432—The Sanitary Institute, 433—Gas in the Shah's Dominions, 433—Ohio Gaslight Association, 433—Congratulations to Mr. George Livesey, 433—The East London Water Company's Dividend, 434—Private Bill Legislation, 440—The Chairmanship of the Sevenoaks Water Company, 440—The Late Mr. Christian Allhusen, 440—Eastern Counties Gas Managers' Association, 443—Death of Mr. G. H. Osborn, of Bromley, 443—The Water Supply of Felixstowe, 445—The Manchester City Council and the Supply of Hydraulic Power, 445—The Public Lighting Question at Bridlington Quay, 445—Proposed Purchase of the Derby Gas Company's Property by the Corporation, 445—The Brighton Corporation and Electric Lighting, 445—Sale of Stock in the Harrogate Gas Company, 446—York and the Bradford Water Scheme, 451—Sale of Shares, 452—The Water-Gas Plant at the Leeds Forge, 452—Coventry Corporation Water-Works, 452—A Fatal Escape of Gas, 452—The Northern Coal Trade, 452—Sale of a Village Gas-Works, 453—The Coze Syndicate, Limited, 453—The Railway Siding for the Coventry Corporation Gas-Works, 453—Lothammer Gas Company, Limited, 454—Gateshead Public Lighting, 454—The Gravesend Gas Company's Bill, 454—The Bolton Corporation's Gas Coal and Lime Contracts, 454—A Sign of the Times, 454—The Revenue of the Manchester Corporation Gas Undertaking, 454.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 11, 1890.

The Gas Institute and the New Institution.

BRITISH gas engineering opinion has been exercised during the past week with reference to the proceedings of the Council of The Gas Institute and of the new Institution of Gas Engineers. It is reported that the former body, at their meeting last Wednesday, decided to put their new rules in the hands of a legal adviser, with a view to obtaining registration as a joint-stock company without the use of the word "Limited" in their title. This is the same course that the new Institution have determined to take; and it may be well to explain why it has been found advisable in these cases, as in all other organizations of the kind established of late years. The fact is that, outside the body of law and precedent created by the Joint-Stock Companies' Acts, there is no trustworthy foundation for a mutual association, whether it be a club, a society, or an institute. When the rules of a voluntary society, not established for profit, have been registered at the Board of Trade, in accordance with the procedure specially appointed in such matters, they have all the force of an Act of Parliament; and the Courts can be safely invoked to carry them out if necessary. There is no room for uncertainty as to the powers, rights, and responsibilities of the individual members or the governing body. Moreover, the liability of members is limited to the amount of their share or subscription to the funds of the society, instead of being unlimited, as in the case of every association outside the Joint-Stock Companies' Acts. It does not require a very extended acquaintance with the decisions of the Courts, as reported in the newspapers, to convince anybody that the rules of unregistered clubs and societies invariably break down whenever they are subjected to a real strain—*teste* the very modern instance of Mr. Baird and the Pelican Club. If, on the other hand, the affairs of a registered association are brought into Court, the Judges have something tangible to go upon. The question of liability scarcely needs explaining. There is no limitation of individual liability in English law outside the Joint-Stock Companies' Acts; and every member of a voluntary association not protected by these Acts is responsible, to the full extent of his means, for the acts of himself and his associates. A sufferer from any wrong committed by such an association need not trouble himself about the terms of membership or the amount of subscription payable by members, but can pick out from them all the most substantial individual, and proceed against him alone. For this reason a prudent man should decline to join any large mutual society in connection with which his personal responsibility is not limited by the means now proposed to be adopted by The Gas Institute and the Institution of Gas Engineers, and already in force in the cases of the Institution of Mechanical Engineers, the National Smoke Abatement Institution, the Sanitary Institute, and other modern societies of the kind.

Another important piece of business transacted by The Gas Institute Council on Wednesday was the appointment of a Secretary, in the person of Mr. W. H. Harvey, B.A., Assistant-Secretary of the Institution of Mechanical Engineers. A London office was also selected at No. 3, Westminster Chambers, Victoria Street, in evidence of the determination of the Council to make a fresh start and put an end to the administration of the Institute from Guildford. This is all quite satisfactory, so far as it goes. Mr. Harvey is a gentleman who has not the advantage, or disadvantage, as it may be reckoned by some people, of having been mixed up with Gas Institute affairs; and he may be able to do the Institute more service as an impartial officer than a better-known man, who must have been more or less identified with one or other of the parties in the late feud. It will take him some time to become acquainted with the members generally, and difficulties may easily arise in connection with the wholly superfluous division of responsibility between the honorary and paid Secretaries of the Institute; but Mr. Harvey will not find the gas managers with whom he is now thrown in contact for the first time a difficult set of men to get on with. The history of the late Secretary, and of how he fared at the last at the hands of a society which he served to the best of his ability for many years, is not likely to be lost upon his successor; but we must altogether decline to "point the moral" for Mr. Harvey. At the risk of giving offence to many who may not relish the calling in question of their magnanimity, however, we must once and for all declare that the circumstances attending the retirement of Mr. W. H. Bennett from the secretaryship of The Gas Institute do not reflect credit upon the members of the Council and of the Institute. The late Secretary had his faults as an official, and he was no popularity hunter; but we have yet to learn that he ever did anything to justify the conduct of a Council that allowed him to depart at the last without a word of farewell. We are not apologists for Mr. Bennett; but neither are we disposed to apologize for The Gas Institute Council.

With regard to the future, it will be nothing to complain of that there will be henceforth two national societies representing the personality of the gas industry of this

country. We remarked last week that the new Institution will have to justify its existence; and the caution may be repeated. The Council of the Institution must see to it that their programmes surpass in weight and interest anything that The Gas Institute can produce, or they will stand convicted of being superfluous. Better papers, better discussed, more businesslike and valuable meetings, must be the testimony to the usefulness of the new Institution, if it is to be anything else than a reproduction of the early days of the British Association of Gas Managers. With a membership scarcely numbering 10 per cent. of that of The Gas Institute, it is for the Institution to show that membership must be weighed as well as counted. The eminent engineers who have fathered it, so to speak, must not rest content with the position of Olympian gods, but must work for the Institution as well as lend their names to it. They do not wish to be identified with a *fiasco*, and must therefore, as a prime necessity, either prepare first-class papers themselves or be the occasion of the preparation of such papers by others. The Secretary, Mr. A. G. Hounsham, has his task cut out to get the Institution into working order in time for an early summer session; but it is not impracticable to do all this, and obtain a thoroughly satisfactory group of papers for the first meeting. A great deal also depends upon Mr. G. C. Trewby; but there is little fear of the first President of the Institution not giving it that start which will be needed to carry it on until Mr. W. King, of Liverpool, takes command in his turn. Mr. Trewby is an indefatigable worker, with a store of experience as a gas maker unrivalled in character and extent. He is sure of an attentive hearing and world-wide notice of his Inaugural Address; and if the Council can only obtain a few papers worthy to follow it, the success of the first meeting of the Institution will be fully assured.

The Condition of the Coal Trade.

THE unsettled state of the coal-mining districts is a matter of national concern; and it is scandalous that, with such vast interests as are imperilled in connection with every strike and lock-out at the pits, there should be so much difficulty in ascertaining the rights and wrongs of the situation. So far as we can safely describe the condition of affairs, there is a desire on the part of the men to participate in the benefit which they believe that their employers, the coal-owners, are deriving from the increased prices paid by coal consumers. That the cost of coal has risen cannot be denied. Railway, steamship, and gas companies admit the fact; and householders know only too certainly that during the winter their coal bills have been considerably heavier. Yet the moment a deputation of coal miners brings this argument to bear upon their employers in support of a demand for higher wages, the coal-owners, if they do not absolutely deny the rise in price, assert one after another that they have not touched any additional profit, or that they have already discounted it in advances of wages. We desire to preserve a position of strict impartiality in regard to this matter; but, in common with the rest of the world, we should like to know who has managed to get the extra money which the consumer of coal has at the present moment to pay? If the men are unreasonable, let the fact be demonstrated. If the masters can justify themselves, why is this not done? What we do complain of is that the national interest of gas supply should be troubled by disputes over the partition of the money paid for the raw material, which a little good faith ought to instantly dispel. It seems, on the face of it, ridiculous that a great industry should be upset and threatened with paralysis because two parties in it cannot satisfy each other as to who gets the lion's share of an advance in price. It is more than ridiculous, it is criminal on the part of anyone who, possessing the key to this mystery, refuses to make the truth known. What is the use of the Peace Society proposing mediation as the means of settlement for disputes between opposed nationalities, while two classes of the same nation, engaged in the same industry, prefer a war of mutual destruction to such a disclosure of the facts as would enable an arbitrator to compose their differences? Will anybody who knows kindly come forward and show, in the columns of the JOURNAL, how the case stands with regard to owners and pit hands in the gas coal trade? In the matter of the gas workers' strikes, all the data were known, and the points at issue were exhibited to the whole country. How is it with the coal trade? With which side, masters or men, should a fair-minded man sympathize in the event of a strike, and why? At a time when Gas Companies are face to face with a possibility of having to raise the price of their product on account of the advanced cost of the raw material, they may at least be excused for expressing curiosity respecting the points we have indicated as requiring elucidation.

The Gas Supply of Birmingham.

THE discussion in the Birmingham City Council on the annual report of the Gas Committee, which will be found in another column, will be read by friends of the gas industry with mingled feelings. It is impossible not to feel satisfaction at the good showing that Mr. Alderman Pollack was able to make of the working of the undertaking, or to deny that, according to their lights, the Gas Committee of the Corporation manage their business well. When we examine the principles on which this great business is administered, however, our satisfaction vanishes. It is becoming increasingly evident that the Committee care next to nothing for the gas consumer, and more and more for the ratepayer, every year. Whatever the price of gas may be, the rates must be subsidized. This is the only rule of management that can be traced in Mr. Alderman Pollack's public utterances. He admitted that the profit made out of the gas undertaking for the past year was the largest ever realized; but he omitted to acknowledge that it had been obtained by a wholly unnecessary increase in the price of gas. He compared the actual selling price with that charged by the old Companies in 1875—a very favourite trick with official apologists of corporation gas management—but was careful to avoid comparison with great Gas Companies of the present day. It would not do to confess that a company in possession of the Birmingham Gas-Works would, at the present moment, be selling gas at about 2s. per 1000 cubic feet all round, and perhaps fostering local trade by special day supplies for manufacturing purposes at 1s. 6d. per 1000 feet, or even less. Yet this is what the Gas Committee might do, and more, if they did not make payments like the two sums of £25,000 and £16,648 to the improvement rate, besides £15,000 to the sinking fund, and £8000 a year to the public lighting. Moreover, the reserve fund is now filled up by putting aside £13,688 out of the past year's profits, in order that its annual interest of £4000 may henceforward go into the insatiable improvement fund; and the Committee contemplate incurring a further burden of some thousands a a year for the lighting of the courts of the town. No wonder the Committee talk bodingly of a probable increase in the price of gas. The wonder rather is that they refrain from offering to bear all the city expenses. There is no reason why they should draw the line where they do. It is only a question of what the patient gas consumer can be induced to bear without rising in red riot. Meanwhile the Birmingham gas consumer remains a spectacle for gods and men, like the poor gentleman written of by La Fontaine as "deceived, beaten, and content."

Patents and Trade Secrets.

AN interesting little article on "Trade Secrets" recently appeared in *Industries*, in which the old question of what is the best thing for an inventor to do with his discovery is discussed once more. Anyone who has ever invented anything himself, or been in the confidence of somebody else so situated, knows by experience the searching of heart that ensues when an invention is perfected, and it becomes a question what to do with it. In many cases, of course, there is no alternative but to patent it; but some inventions would simply be given away if they were described in a patent specification. When the object of an invention is to produce an entirely novel commodity—such as the incandescent electric lamp, for example—which cannot be copied without disclosing the fact, or when it is something to sell, a patent is generally sufficient protection. Supposing, however, the discovery is a manufacturing process for cheapening the cost of producing a marketable commodity, it is questionable whether the inventor would not be wiser to work it as a trade secret. It is not the least objectionable feature of a patent that it may at any moment involve the patentee in ruinous litigation, whereas a trade secret can only be discovered. Piracy and discovery alike destroy the property of an

inventor; but the latter is, if anything, the cheaper way of losing it. There is a great difference between the working principles of different men. Some are open as the day. They get their brains picked occasionally; but the process does not irritate or exhaust them. Others are absurdly secretive; everything they do being covered up as though it were a great mystery, although, in point of fact, the "man in the street" may know all about it. Whatever may be said respecting manufacturing chemists and mechanicians, who always seem to go through life in momentary expectation of dropping upon something that will make Brunners or Bessemers of them, we hold that for gas engineers patents are mostly a snare. There is very little in gas making or distribution that can be made the basis of a paying patent; and, of course, the idea of anything like a "trade secret" in a gas-works is absurd. We do not say that a few men now and again will not secure profitable gas patents; but the number must be a small proportion of the total number of patentees. To young men especially, when tempted to make private property of an idea that seems to them useful in their industry, caution may be recommended in this matter. Patents do not cost much now-a-days; but, on the other hand, they are frequently worth less. It may often be desirable to provisionally protect an invention just for the sake of establishing proof of priority, even if it is not thought necessary to protect it further. Generally speaking, the most profitable use of an invention in the gas industry is to enhance the professional reputation of the inventor. It is sometimes difficult for inventors to see this at the time; but it is certain that a great many more men regret having gone into the Patent Office than repine because they were once pesuaded to keep out of it.

Coal in Kent.

The alleged discovery of coal near Dover has occupied much attention during the past week or two, and now that the truth of the first reports has been placed beyond doubt by the testimony of Professor W. Boyd Dawkins, it is necessary to take account of the matter as not the least important event of the year. When it was reported that the boring near the entrance to the proposed Channel Tunnel had struck coal, to the honour and glory of Sir Edward Watkin, many people who do not admire that energetic gentleman hardly knew what to make of the intelligence. Sir Edward Watkin's obstinate adherence to the Channel Tunnel project is notorious enough; but it was not very generally known that, having been prevented from boring in a horizontal direction under the Channel bed, he had been indulging his passion for the drill—and keeping the tunnel works warm, so to speak—by boring vertically downwards for coal. Consequently, when the announcement of the striking of coal on the property of the Channel Tunnel Company appeared in the newspapers, the most widely-spread feeling concerning it was curiosity as to the possible effects on the Company's shares. Somebody has doubtless made a good thing out of this business; which is a striking illustration of the truth of the proverbial saying that if anything is kept long enough it is sure to be valuable. The Channel Tunnel Company have, in all conscience, been kept long enough; and now those shareholders of the concern who happened to be "in the know" betimes have been able to "do a little flutter," if they so desired. The early bird having picked up his worm, however, it remains to be seen what the discovery really amounts to. Professor Boyd Dawkins describes the specimens brought up by the drill as "good blazing coal," and remarks that the measures in which it occurs at Dover are at a depth well within the mining limit. The thickness and extent of the seams, as well as the quality of the coal, cannot be ascertained without further exploration and experiment; but Professor Prestwich, who years ago predicted the occurrence of coal at somewhere near the locality and depth of the Dover boring, believes that the coal will be similar to that raised in Belgium or Somersetshire, and will lie in long, narrow deposits. If this anticipation is justified like the rest of the prophecy, it does not follow that the boon of a supply of fuel so near London will be counterbalanced by the drawback of turning Kent into another Black Country. The consequences that may follow on this discovery will be so governed by considerations at present unknown that it will be better to say nothing about them, but wait for the future to develop its own conditions.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 454.)

The Bank of England lowered its rate to 4½ per cent. on Thursday; but it has given little satisfaction. A strong opinion is entertained in some quarters that the Bank's financial position would have warranted a 4 per cent. rate. Anything in excess of this figure appears to be quite impotent to effect any revival of business. As matters now are, complaints are rife that never was there such complete stagnation in the Stock Markets; and a very gloomy view of the business outlook prevails in some of them. The Gas Market, however, has not been among the chief sufferers. Business was rather quiet in the earlier portion of the week; but there was more activity apparent towards the close. The general tendency throughout was in favour of firmness; and some issues have materially improved their quotations. Gaslight "A" has continued the upward movement which was commenced in the preceding week; although one or two cheap bargains were made on Monday, and on Friday the last mark was 251. Other issues have also been in good demand. The "F" and "J" preferences commanded nearly top figures. The first-named deserves a higher quotation. The "H" has been active; and the price is higher. South Metropolitans have been very quiet, only a couple of transactions in "B" on Wednesday being marked. A change in the quotation of "C," to 222-227 noted on that day, was probably meant for "B;" the old figures being resumed the next day. There was some enquiry for the debenture stock. In Commercials, the old stock was done once specially at top price. The selling price of the new was raised on Friday; but we doubt whether actual sellers could be found even at that figure. A further advance of 5 on Saturday was the consequence; but the quotation is purely nominal. The Suburban and Provincial undertakings have scarcely been noticed. Alliance and Dublin is ½ better. The Crystal Palace Company will meet on Friday, and declare their usual dividends, which they have very nearly earned. The accounts for the half year are in general about what might be expected, having regard to the circumstances of the period. Among the Foreign companies, Imperial Continental has moved up 1; but transactions remain at about the old mark. Buenos Ayres is a little weaker; but other stocks show no variation. Water stocks have been more than usually active, and quotations are firm. The only move was the restoration of Kent to the figures from which it was unaccountably deposed the week before.

The daily operations were: Very quiet business in the Gas market on Monday; but prices were good. Gaslight "A" and "H" both opened at top figures; but the former being afterwards done "specially" at 245, the quotation was kept down. Several Water stocks changed hands at good average prices; and Kent rose 1. On Tuesday, Gaslight "A" advanced, but it was not dealt in. All the business was in "H" and "J." Alliance and Dublin improved ½; but Buenos Ayres and Continental Union were rather weaker. Water was much quieter. Good prices ruled on Wednesday; many issues commanding the top figures. The only move, however, was an advance of 1 in Imperial Continental. Water was still quiet and unchanged. Gas was rather languid on Thursday, at about the old prices. South Metropolitan "B" rose 5; but Buenos Ayres receded ½. Water presented no feature. General activity in Gas stocks was renewed on Friday, with a good upward tendency. Gaslight "A" rose 3; and Commercial new 2½. Water also was more brisk. Continued firmness in Gas was the characteristic of Saturday. Gaslight "H" advanced 1; and Commercial new, 5.

ELECTRIC LIGHTING MEMORANDA.

Other Uses than Lighting Required for Electricity—The Safety of Electric Light Installations—High and Low Pressure Systems of Distribution—The St. James's and Pall Mall Electric Light Station.

Last week the Directors of the London and Southwark Subway Company invited a party of gentlemen to witness a preliminary trial trip of the electrical tramcar train which will in the future connect London Bridge and Stockwell through a tunnel pierced at about 70 feet below the surface of the ground. This is really a wonderful work; the tunnelling having been carried on without interfering with the surface, or with the drains and other works buried in the subsoil. There are two tunnels, for the up and down lines respectively; and these are more like the galleries of mines than anything hitherto devised for purposes of locomotion. The carriages will fit the shape of the tunnels almost tightly, and as all the traffic in each will be one way, there need be no difficulty about ventilation. The trains of cars will not take more than 100 passengers at a time, but they will run frequently. The tractive power and the lighting will both be supplied by electricity; and, in connection with this project, the *Daily News* writer on electrical subjects whose high-flown language we have repeatedly criticized in this column, takes the opportunity for admitting that lighting will only afford a limited field for electricity—the inference being that some more tunnels must be made to provide work for electrical locomotives. It is satisfactory, so far as it goes, to

find an electrical prophet driven to admit the essential limitation of the field for electric lighting in this country; and, in response, we have no objection to concede that an underground railway seems to afford the best possible scope for utilizing electrical locomotives, which, if dearer than steam motors, are manifestly preferable for tunnels requiring artificial ventilation.

The letter of Major Flood Page to *The Times* on the subject of the fire risks of electric lighting, to which reference was made in this column a fortnight ago, appears to have been written to the order of the Electrical Section of the London Chamber of Commerce, who originally asked the Earl of Crawford, Mr. Crompton, and Major Flood Page to join in a communication to the newspapers respecting the fire that recently occurred at No. 8, Grosvenor Square, and which was traced to the electric light wiring. The intention was to reassure the public with regard to the safety of electric lighting when the internal fitting work is properly done; but the combined action could not be brought about. Consequently the energetic Secretary of the Edison-Swan Company took the matter in hand himself; and if his letter contained one or two sly recommendations of his Company's system, and as many veiled disparagements of the system of electrical distribution with which the names of the Earl of Crawford and Mr. Crompton are connected, it is only what might be expected in the way of business. We are not concerned to deny that if an electric light installation is carried out at the cost and with the care that seem to have been expended in the case of the British Museum, this method of lighting is probably as safe as any kind of artificial light that can be had for money. But since so much precaution is needed, it occurs to an observer of such matters that equal or perhaps less care would ensure equal safety with gas or even with oil-lamps. It is admitted by electricians themselves that, without a particular amount of care and skill in the execution of the necessary internal fittings, electric lighting is dangerous. The question then turns upon the assurance the user can obtain of this care having been exercised in any example of electrical fitting. So it all comes back at last to the trustworthiness of the workman, upon which safety depends in electric lighting just as with gas; and the comparative reliability of electrical and gas fitters is a very delicate subject to pronounce upon.

The controversy respecting the comparative advantages and drawbacks of the high and low tension systems of electrical distribution threatens to be endless. It is clear enough that if electricity for lighting or for power is to be transmitted to any distance from the generating station, a high-tension system is the only possible means of avoiding a ruinous outlay in copper mains. On the other hand, the low tension is the only really safe plan for town use; and it remains to be shown that, within its proper range, it is not as economical as any other. Sufficient attention has not yet been given, however, to the possibility of a combination of the two systems, on the principle followed by Professor Robinson for the proposed St. Pancras installation. Another example of this idea of combination is the Halles Centrales installation of the Paris Municipality. Here the station is in the vaults of the market; and the low-tension and high-tension plants are quite distinct. The low-pressure plant is the only one at present working. Three vertical triple-expansion 150-horse power engines are employed, each driving two Edison dynamos supplying 450 ampères at 115 volts. For the high-pressure service three 170-horse power engines will be used, driving Ferranti dynamos maintaining a pressure of 2400 volts. The Municipality are very anxious about the safety of this high-pressure circuit, and insist upon keeping the transformers outside consumers' premises, to diminish the risk of the service. As, however, there do not appear to be any subscribers as yet for the high-pressure supply, there is no danger. The low-pressure business is developing, but slowly; and it is consequently not yet possible to draw up anything like an instructive balance-sheet of the undertaking. It costs the Municipality about 500 frs. per hour to keep the works going, for which there does not appear to be much return as yet.

A description has appeared in the newspapers of the central station of the St. James's and Pall Mall Electric Light Company, which stands in Mason's Yard, Duke Street. It is a three-storey building, with steam machinery in the basement and offices over, and is said to be the most compact establishment of the kind in the country. Davey-Paxman locomotive boilers supply the steam, and Willans compound central valve engines, coupled direct to Siemens and Latimer-Clark dynamos, constitute the electrical generating plant. Elwell-Parker secondary batteries are employed for storeage; and all the supply will pass through them. The distribution is to be on the three-wire system; and a ring main, charged to 107 volts pressure, is laid round the district. The output of the station is equal to 16,000 lamps of 16-candle power nominal; and the principal customers are the clubs in the neighbourhood. This appears to be a typical installation for a rich locality; and if the business of electric lighting does not pay here, it will not pay anywhere.

Mr. Alfred J. Hope, of the Chester Gas-Works, pupil of Mr. Robert Hunter, and previously of Mr. Fletcher W. Stevenson, has been appointed, out of a large number of competitors, as assistant to Mr. Holgate, Engineer of the Halifax Corporation Gas-Works.

ALFRED PENNY.

It is with great regret, which will be shared by many readers of these lines, that we record the death, on Tuesday last, at the ripe age of 79, of Mr. Alfred Penny, the well-known Consulting Gas Engineer. Mr. Penny may be described as the last of the band of engineers which included Stevenson, Spice, and their contemporaries, to whose labours in establishing the *status* of the gas industry in Parliamentary Committee-rooms, in Arbitrations, and in the Courts, the present generation of gas proprietors and administrators owes so much. It was quite in the early days of gas lighting when Mr. Penny, who had works in the Wharf Road, City Road, began the construction of gasholders and the erection of gas-works in different parts of the country. In these enterprises he was associated with all the pioneers of the industry, whose names are now almost forgotten, but who were justly renowned as leaders in the latter part of the first half of the current century. From building small works, Mr. Penny became lessee of undertakings of his own creation, and also of larger ones—including the works at Whitehaven, Portsmouth, and Oporto. Mr. George Garnett, M. Inst. C.E., the President of The Gas Institute, was Mr. Penny's Manager at Portsmouth. In this way Mr. Penny made a reputation as an expert in gas management, which led to appointments in a consultative capacity for many gas companies and corporations in Parliament and for general purposes. He established his renown in the committee-rooms in connection with the Dundee Bill; and from 1865 onward for twenty years he was a leader in this branch of the profession, and was always engaged in important cases. His integrity was universally recognized; and his kindliness and willingness to help those who came to him for advice and assistance, were conspicuous. He was a hard and conscientious worker, never failing to satisfy his numerous clients that the best had been done for them, even when their cause happened to be unsuccessful. Of late years his tall, slightly-bent figure was less frequently to be seen in the corridors of the Houses of Parliament; and for some time past he had lived practically in retirement. He was never a self-assertive man; and his work being done, he dropped out of the ranks quietly, as his manner was. He was buried at Beckenham last Saturday. His surviving family consists of five sons and two daughters. Mr. Penny was elected an associate of the Institution of Civil Engineers in 1859, and was raised to membership in 1877.

Bay State Gas Company of New Jersey.—The London agents of the Bay State Gas Company of New Jersey (Boston United Gas Bonds) announce that the following figures have been forwarded to them by the President of the Company as the result of the working for the year 1889:—Total receipts, $2,074,971; expenses, $1,334,175—difference, $740,796; deduct cost of construction debited to income, $183,779; net profit, $557,017; required for interest on $7,000,000 first mortgage 5 per cent. bonds, $350,000; leaving $207,017.

The American Export Petroleum Trade for 1889.—According to the annual report compiled by Messrs. Whitman and Fisher, Inspectors of Stowage for vessels loading petroleum, of New York, the total shipments of petroleum for 1889 amounted to 7,903,093 barrels and 20,365,471 cases; the latter being chiefly of refined oil, with some naphtha. The shipments were from the ports of New York, Philadelphia, Boston, and Baltimore, and are classified as follows:—Refined oil, 6,212,009 barrels; crude oil, 1,423,866 barrels; naphtha, 261,765 barrels; residuum, 5453 barrels; refined lighting oil, 19,248,341 cases; crude oil, 1,085,651 cases; naphtha, 31,479 cases. The largest port of shipment was New York; and the principal port of reception was Bremen, closely followed by Hamburg, after which comes Antwerp. London did not import much more than half the quantity of oil that went to Bremen or Hamburg. Most of the refined oil in cases went to Eastern ports, such as Hiogo and Shanghai.

The George Livesey Testimonial Fund.—Our readers will no doubt remember that at the close of the recent meeting of the South Metropolitan Gas Company a Committee was formed for the purpose of raising a fund for a testimonial to Mr. George Livesey, Chairman of the Company, in recognition of the eminent services rendered by him to the community generally on the occasion of the strike of gas stokers in South London in December last. Among the gentlemen who constituted the Committee then formed were Mr. John Aird, M.P., Mr. H. Butler, Mr. R. Foster, Mr. J. Joicey, M.P., Mr. William Woodall, M.P., and Sir W. H. Wyatt; and since then the names of some 120 others—representative men in various professions—have been added. Sir W. H. Wyatt is the Chairman; and the duties of Treasurer and Hon. Secretary have been undertaken by Mr. R. Foster and Mr. A. G. Hounsham. With the view of making the basis of the testimonial as wide as possible, it has been decided not to confine the subscriptions to the proprietors of the Company, and to request that individual contributions should be limited to two guineas each. These may be paid into the London Joint Stock Bank, 5, Princes Street, E.C., or any of its branches, to the credit of the "George Livesey Testimonial Fund."

THOMAS WRAKE RATCLIFF.

We regret to announce that the Commercial Gas Company have just sustained a serious loss by the death of their Chairman, Mr. Thomas Wrake Ratcliff, which took place at his residence, Albert Road, Regent's Park, on the 1st inst., in his 67th year. Mr. Ratcliff was senior partner in the firm of Messrs. Ratcliff and Son, Solicitors, of New Broad Street, and he was probably the oldest public official in the East-end of London; his services in this connection dating as far back as 1845, when he became Clerk to the Trustees of the hamlet bearing his name. He was elected a Director of the Commercial Gas Company in 1873; was raised to the position of Deputy-Chairman in 1888; and about a year ago succeeded the late Mr. Richard Bradshaw in the chairmanship. As a public man in his district, Mr. Ratcliff did some excellent work. On the formation of the Limehouse District Board of Works in 1856, he was appointed Clerk, and held this post up to the time of his death. For many years he was District Auditor under the Local Government Board, and also Returning Officer for the parliamentary borough of the Tower Hamlets, as well as Coroner and Steward for the Tower and its Liberties, and a Deputy-Lieutenant for the Tower Hamlets. The railway and dock undertakings of his district had the advantage of his assistance; he being Deputy-Chairman of the Blackwall Railway Company, Deputy-Chairman of the London, Tilbury, and Southend Railway Company, and Auditor of the London and St. Katharine's Dock Company. It was attending the last general meeting of the first-named Company, in unfavourable weather, that brought on the illness which hastened his death; although its immediate cause was heart disease. At the meeting of the Limehouse District Board of Works last Wednesday, feeling reference was made to the loss the Board had sustained; and a vote of condolence with Mr. Ratcliff's widow and family was passed—special testimony being borne to the integrity, candour, and underlying kindliness of the deceased gentleman, who was a native of the district, where his father, in his time, held all the principal parochial offices.

The Sanitary Institute.—The Council of the Sanitary Institute have accepted an invitation from the Town Council of Brighton to hold the autumn congress and health exhibition in that town in September next.

Gas in the Shah's Dominions.—The Shah is about to introduce some Western light in his dominions. To this end he has commissioned his Ambassador in Berlin to send engineers, technologists, and workmen to Persia in order to provide the larger towns there with gas-works.

Ohio Gaslight Association.—The sixth annual meeting of this Association is to be held at Toledo (Ohio) on the 19th, 20th, and 21st inst., under the presidency of Mr. E. Lindsley, of Cleveland. According to the programme of business issued by the Secretary (Mr. Irwin Butterworth), the time of the members will be fully occupied. Eight subjects are set down for discussion; and a number of matters of interest in connection with the management of gas undertakings will be brought from the "question-box." The following are the papers promised:—"Theory and Practice in Gas Management," by Mr. J. M. Bate, of Canton (Ohio); "Municipal Control of Lighting," by H. Wilkiemeyer, of Portsmouth; "Combination of Gas and Electric Lighting in a Small Town," by Mr. G. W. Bowers, of Hillsborough; "Our New Coal Gas Works," by Mr. G. A. Hyde, of Cleveland; "Advantages of a Combined Coal and Water Gas Plant," by Mr. G. Light, of Dayton; "Another Year with Fuel Gas," by Mr. C. H. Evans, of Jackson; "Ohio Street Lighting Statistics," by Mr. W. C. Hedges, of Mansfield; and "Graduated *v.* Uniform Rates," by Mr. C. R. Faben, jun. In connection with the meeting, there will be an exhibition of all kinds of gas appliances. The occasion therefore promises to be a highly instructive one.

Congratulations to Mr. George Livesey.—We have received from Mr. R. P. Keys, Secretary of the West Kent Gas Company, a copy of the following letter, which, by instruction of his Directors, he addressed last Tuesday to Mr. George Livesey:—"Dear Sir,—It affords me personally intense pleasure to have the satisfaction of forwarding to you the following resolution passed yesterday at the general meeting of the shareholders of the West Kent Gas Company:—'Resolved—That this Company in General Meeting assembled beg to tender our thanks to George Livesey, Esq., for the successful manner in which he crushed an agitation that was alike hurtful to gas companies as well as those men employed in the production of gas.' The resolution was proposed by George Anderson, Esq., and Charles Beadle, Esq., and James Randall, Esq. (of Tottenham), rose together to support it; and after the three speeches, as soon as the Chairman—James Page, Esq.—could put it to the meeting, it was carried by acclamation. It is true we are only a small Company, with 188 shareholders—small compared with the South Metropolitan; but I feel assured that you will appreciate this spontaneous expression of sympathy and approval of the course you were enabled to pursue, feeling as we do that you thereby have been the means of conferring not simply benefit to the shareholders, but to the tens of thousands of the working men themselves, whose personal interests you have thereby so successfully promoted."

ENGINEERING HONOURS.

On the occasion of the opening of the Forth Bridge last Tuesday by the Prince of Wales, His Royal Highness announced that the Queen had been pleased to create Sir John Fowler, the Engineer-in-Chief of the bridge, a baronet; and that it was her intention to raise Mr. Benjamin Baker, M. Inst. C.E., Sir John's colleague, to the dignity of a Knight Commander of the Order of St. Michael and St. George; and to confer on Mr. W. Arrol, one of the contractors, the honour of a knighthood. It may be of interest to notice briefly the careers of the three men whose latest work has brought them these distinctions. Sir J. Fowler has passed a lifetime in railway construction; among the first lines upon which he was engaged being that to Brighton. His reputation with the general public of the present generation rests to a great degree on his construction of the Metropolitan Railways. The Inner Circle system was the direct outcome of his recommendations. He was President of the Institution of Civil Engineers in the year 1866; and in 1885 was created a Knight Commander of the Order of St. Michael and St. George, for his important services and guidance to the Government in connection with Egypt. His latest achievement was commenced in 1883. Sir Benjamin Baker's professional training began in the workshops of Mr. H. H. Price, a Civil Engineer, in South Wales. On coming to London, he entered the office of Sir J. Fowler, and gradually became associated with him in all the important works upon which he was engaged. Sir B. Baker holds an official position under the War Department as a civil member of the Ordnance Committee; and he has advised many public bodies on engineering works of a varied character projected or undertaken by them. Our readers may remember that he was consulted about ten years ago by Mr. George Livesey on the subject of the stability of the large three-lift gasholder which had then recently been erected in the Old Kent Road; and his report, which was given in the Journal for Jan. 25, 1881 (p. 141), confirmed the opinion which had always been held by the initiator of what was then regarded as a daring piece of construction. He is now assisting the London County Council in solving the difficulties of their sewage-disposal problem. As a member of several scientific and literary societies, the new K.C.M.G. has done much to advance the profession of which he is so able a member. The career of Sir W. Arrol has been a remarkable one, as it is that of a man who has risen from the humblest position occupied by a worker in iron to be one of the principal contractors in the United Kingdom. He was originally a working blacksmith; and he was generally occupied at this work in alternation with boiler making and fitting. He subsequently became foreman of the bridge and boiler departments in the works of Messrs. R. Laidlaw and Son, of Glasgow and Edinburgh, in which position he remained for some time. About twenty years ago he commenced business on his own account, in a very modest way; but such was the sterling character of his work that in less than three years he was entrusted with the contract for the iron bridges on the Glasgow, Hamilton, and Bothwell Railway. Other important works followed, culminating in the gigantic undertaking which his firm (Messrs. Tancred, Arrol, and Co.) have just successfully completed. It may not be out of place to add here that when the Forth Bridge was commenced, it was suggested that the Board of Trade Inspectors (General Hutchinson and Major Marindin) should present a quarterly report to Parliament upon the progress of the work. In their final report, just issued, the Inspectors record their opinion that the structure is a wonderful example of thoroughly good workmanship with excellent materials, and that, both in its conception and execution, it is a credit to all those who have been connected with it, bearing as it does testimony to the ability of the Engineers who have designed it, to the skill and resource of those who have superintended and constructed it, and to the zeal and courage of the workmen employed upon it.

ELECTRICAL ENGINEERING.*

A trustworthy handbook relating to the principles and practice of modern electrical engineering is very badly wanted at the present time. We are often asked whether we can recommend a book containing all that a gas engineer or public official need know about electric lighting, whereby he might post himself up in the matters that are most commonly inquired about by his employers; but hitherto our answer to all such questions has necessarily been in the negative. To say nothing about the elaborate treatises of native and foreign professors of physical science, whose pages bristle with terrifying mathematical expressions, our bookshelves bear many volumes devoted to electrical science; but none of them is altogether satisfactory. The literature of electric lighting, like that of most other arts and crafts, has suffered grievously from the "book maker," who compiles pretentious volumes out of trade catalogues, padded with a few chapters on first principles badly abstracted from some of the treatises aforementioned. The right kind of technical book

* "Electrical Engineering for Electric Light Artizans and Students (embracing those branches prescribed in the syllabus issued by the City and Guilds of London Technical Institute)." By W. Slingo and A. Brooker. With 307 illustrations. London: Longmans, Green, and Co.; 1890.

—the plain description of good modern practice, elucidated by reference to as much sound, well-digested science as is necessary to supply a foundation to the practice—is as scarce in electrical engineering as it is in all other industrial literature. The authors of the book before us start with the great advantage of not being known in connection with any party in the electrical world. They are both instructors in telegraphy and general electrical engineering at the People's Palace, London; and declare their subserviency, if the term may be used without implying anything depreciatory, to the City and Guilds of London Technical Institute. It can at once be admitted that for the purposes of such readers as we have in view, a course of instruction that would satisfy the Examiners of the City and Guilds Institute would be quite good enough. The authors of this book state that they have designed it to cover the syllabus of the Institute, and to supply artizans and students with instruction meeting all the requirements of workers in practical electric lighting; and if their execution bears out their intention, this should be the book we have so long looked for. Let us now see how the authors carry out their praiseworthy design.

Messrs. Slingo and Brooker say in their preface that "as a rule, the most successful electrical engineers are evolved from good mechanical engineers;" the natural interpretation of this fact being that a sufficiency of electrical knowledge for practical purposes is acquired more readily than handiness in mechanical work. Electric light engineering has suffered seriously from the domination of college professors and men of laboratory training; and it would never have become the practical art it is but for the intervention of men like Edison, Brush, Westinghouse, and others who put the principles discovered by the philosophers into a working dress. The best electric light engineer would be the practical gas engineer, if the latter took the matter in hand—not that the gas manager would be able to devise the three-wire system of distribution, or reduce the efficiency of an alternating transformer to a function of the power passed through it; but given the nature of the work to be done in any system of electrical distribution, he would know how to do it with very little instruction. Generally speaking, the man of mechanical training who dips into electricity soon grows familiar with the ordinary electrical phenomena; but he is apt to regard what is commonly known as a "current of electricity" in too material a light, as though it were really ponderable. Messrs. Slingo and Brooker's first chapter is a good antidote to this tendency. The first real difficulty which a mechanic meets with in electricity is in the matter of measurement; and accordingly we always judge of the practical value of an electrical handbook by its chapter on the measurement of electrical quantities. The authors of this book go into this subject in their second chapter, which is wise, for precision of ideas regarding the powers and capacities of electrical apparatus is a prime necessity which can never be assured if the student is first taken through a number of descriptions of phenomena and apparatus, and the only information respecting the measurement of these forces and instruments is stowed away in a chapter at the end of the book. A particularly full explanation of Ohm's law is given, with worked examples. These lead directly to illustrations of circuit distribution and resistance measurements. It is only when these superficially "dry," but intrinsically important, points of electrical engineering are settled that the authors turn to the primary batteries, with which most "popular" books on electricity begin. Our respect for this work rises when we find that the treatment of this part of the subject is truly elementary in the best meaning of the term—nothing being slurred over from want of knowledge, which is the general failing of most writers who profess to treat scientific subjects in what they deem an "elementary" manner. We cannot, however, devote space to a detailed analysis of the contents of this useful book, which appears to contain everything about electricity, from Daniell's cells to standards of light. All the matter is modern, and so are the illustrations, which is a great point in a book of this class. The authors evidently prefer the Methven screen as a working standard of light, though they are perfectly fair to pentane.

In concluding this necessarily curtailed notice of Messrs. Slingo and Brooker's work, we can only express admiration of it as a whole. If there is anything lacking, it is examples of complete lighting installations; showing how the different parts and appliances so ably described separately have been combined by good authorities. We should have liked, for instance, to see critical descriptions by the authors of the Bradford, Chelsea, Kensington, and one or two other typical public and private installations, by way of showing how apparatus is really employed. Short of this, however, the book is extremely good, and will certainly supply a want. It is a thick, well-printed volume of 630 pages, with a good index, and well worth the half-guinea asked for it. The next edition should have an appendix containing the additional matter suggested, the lack of which is alone sufficient to prevent our recommending it as a *vade mecum*. It is good, so far as it goes; but it does not go far enough.

The East London Water Company's Dividend.—The Directors of the East London Water Company recommend a dividend to Christmas last at the rate of 7½ per cent. per annum, carrying forward £20,863.

NOTES.

Mr. Aitken's Further Researches on Atmospheric Dust.

Mr. John Aitken has made a further communication to the Royal Society of Edinburgh on atmospheric dust particles, with special reference to results of experiments made in various places with the author's portable dust-counting apparatus. The object of these observations, to which several references have been made in the JOURNAL, is to ascertain the relation between the extent to which the air of a locality is loaded with dust and its meteorological and other conditions. The influence of populous places in making air dusty at great distances, is strikingly shown by these experiments. Observations on the Eiffel Tower showed great variation in the proportions of dust, indicating unequal diffusion of the impure city air among the higher currents. Very few tests were made in London; and Mr. Aitken does not regard the numbers representing dust particles in city air as worth much—the immediate surroundings exercising such an important influence that comparisons are rendered nugatory. The experiments, as a whole, disclose a vast amount of pollution of the atmosphere by human agencies; for while on the top of the Righi and in the wilds of Argyllshire, air has only a little more than 200 dust particles per cubic centimetre, near villages the number goes up to thousands, and in cities to hundreds of thousands. The atmospheric condition known as haze is ascribed by Mr. Aitken mainly to dust. Dust particles have great power for condensing moisture. In all fogs tested by Mr. Aitken, the amount of dust has been found to be great; and this is what might have been expected. One condition necessary for the formation of a fog is calmness of the air. But when air is calm both dust and moisture tend to accumulate; and the dust, by increasing the radiating power of the air, soon lowers its temperature, and causes it to condense vapour on the dust particles, and form a fog.

The Stability of Walls.

The report of the Commissioners—Colonel Malcolm, R.E., and Mr. W. W. Robertson—appointed by the Secretary for Scotland to investigate the causes of the fall of Messrs. Templeton and Co.'s new mill at Greenhead, Glasgow, should be carefully studied by all architects and engineers who may at any time be called upon to design buildings of large size and considerable height. This remark specially applies to gas engineers, whose retort-houses differ very little in character, if at all, from large mill buildings, before the distinctive fittings are put in. In this case a large unfinished building of four brick walls collapsed during a gale; entailing great loss of life and destruction of property. The cause is declared to have been the weakness of the back wall, which was straight, and unsupported throughout its whole length by any strut or stay. It was subject to a large though unascertainable wind pressure through openings in the front wall and the absence of a roof, while the pressure of the wind on the front wall was also transmitted to it by four tiers of joists fixed ready for the flooring. Consequently, this back wall was not only easy to blow down, but it was certain in its fall to drag down the front wall with it. The lesson of this disaster is that there must never be a weak back wall in a building. Walls have but little lateral stability, especially when the work is green; and it is rash to run them up without providing sufficient support to meet possible wind pressure along the line of least resistance. It appears to be considered that the strengths defined for walls by the Building Act are sufficient, especially if the foundations are solid.

Cause of the Failure of Carburetted Wood Gas.

As it is always instructive to know the causes of failure of a manufacturing process, we repeat a statement made in the columns of the *American Gaslight Journal* by Mr. A. B. Richardson, of the Dover (Delaware) Gas Company, respecting a wood-gas process tried in that town in 1862. The gas-works were built just before the war, to manufacture rosin gas; the price of the raw material being low. During the war, however, rosin rose in value to $60 per barrel; rendering a cheaper method of gas making desirable if the town was to be kept alight. Yellow pine was cut up into small blocks and soaked in oil until the wood was completely saturated. These blocks were then piled in a charger, and the charger put into a retort. The result was the production of a very good kind of charcoal, and of a mixed gas which was scrubbed and purified with lime in the ordinary way. The quality of the gas was very irregular. If the wood blocks had absorbed precisely the right proportion of oil, the gas would be good. If not enough oil had been taken up, the light would be poor; if too much, it would smoke. In fact, the ceilings of all the consumers' houses were well blackened; and, furthermore, the oil condensed in the pipes and fixtures, so that, when a burner-cock was opened, the oil would come out in a spray before the gas would light. If any burner had not been used for a few days, the stagnant gas in the pipe would be so poor that it would not ignite until the fresh gas came. Moreover, the pyroligneous acid destroyed the diaphragms of all the dry meters in the town. Finally, the consumers became so disgusted with the gas, or rather with the troubles incidental to the process of making and distributing it, that they gave up using it, and the works were closed until converted, a year later, into coal-gas works. This story is told *à propos* of a project now on foot for making a mixture of wood and oil gas in some American towns.

COMMUNICATED ARTICLE.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXXVIII.

Mr. W. H. Spencer, of New York, points out that the constitution of petroleum is so complex that its exact behaviour when subjected to destructive distillation is beyond the grasp of modern science.* But there is the general principle, applying both to the marsh gas and to the olefine series of hydrocarbons, that when heated beyond their boiling points, they are decomposed, with the formation of lower members of the same series. In each case the lower members are permanently gaseous at ordinary temperatures, while the higher ones are liquid; and therefore it is possible, by the action of heat, to convert petroleum almost entirely into permanent gas. In subjecting petroleum to the heat used in gas making, we must conceive it as undergoing a multitude of chemical changes; the higher members of each series falling by successive steps toward the lower or gaseous members. This is illustrated by the known fact that a gallon of petroleum can, by careful watching, be converted into gas with the exception of a slight deposit of carbon; and if the action of the heat could be absolutely controlled, there would probably be no solid residue at all. When the oil is used as a gas-making material, the object is to approach such a degree as nearly as possible. The fluid is completely gasified, and at the same time the whole of the carbon is maintained, as nearly as possible, in combination with the hydrogen; and the result is a very rich oil gas. If such gas is exposed to a temperature exceeding that necessary for its formation, two important changes take place. The members of the olefine series are converted into others of the marsh gas series. This takes place without change of bulk, but with a depreciation of carbon, as each atom of "olefine" drops half its carbon, as shown by the change of olefiant into marsh gas, thus:

$$C_2H_4 - C = CH_4$$

The other change is the decomposition of the marsh gas series into free hydrogen and carbon, which is accompanied by a doubling in volume, owing to the fact that in gaseous combinations of hydrogen and carbon the mixture takes up only half the volume that the hydrogen alone would occupy if free. The hydrogen contained in a gallon of petroleum is equivalent to that present in about 90 cubic feet of marsh gas, or to 180 cubic feet of pure hydrogen. It is remarkable that the yield of gas obtained in practice, which is about 90 cubic feet per gallon, agrees with the equivalent of marsh gas.

Mr. Spencer proceeds to consider the question of the dilution of oil gas, which is too costly, and also too high in quality, for use by itself. The only suitable diluents known are hydrogen and air. Both of these have been tried, but with very indifferent results. Dilution with air produces a very heavy gas, the flame of which vacillates with the least draught, and is easily extinguished. It is difficult in practice to secure a regular mixture, and therefore a uniform composition. But the chief objection is that the air has a direct action on the luminosity of the gas, apart from its mechanical action as a diluent, and therefore not more than 40 per cent. of air, at the outside, can be used. Pure hydrogen fulfils the demands of a diluent, both chemically and physically; but the cost of producing it has hitherto proved prohibitory. The cheapest method of generating it is the decomposition of steam by means of carbon; and the various methods applied for the utilization of this principle are objectionable—being wasteful of material, or not yielding a pure product. If we regard the rich oil gas as hydrogen overloaded with, or containing an excess of carbon, it then becomes feasible to use this excess of carbon for the decomposition of steam, with consequent increase of bulk. If gas at ordinary temperature was admitted into a red-hot retort, together with a regulated proportion of superheated steam, the result would be the decomposition of the latter. The oxygen would combine with carbon from the oil gas, forming carbonic oxide; and the hydrogen from the steam, together with that combined with the carbon, would be liberated in the free state, and go to increase the bulk of the gas. The temperature of the steam must be so adjusted that at no point in the retort will the temperature fall below that necessary for the decomposition of steam by carbon—say, 1000° Fahr. In order to secure this result, it is necessary that the oil, before its admission into the retort, should be really converted into gas, and not merely into vapour. A large quantity of heat is absorbed during the conversion of any substance into the gaseous state; and therefore if this were completed in the same vessel where the steam was decomposed, there would be a risk of reducing the temperature.

If the whole of the carbon present in the oil gas were decomposed by the introduction of a proper quantity of steam, the result would be a yield of about 520 cubic feet of gas per gallon of petroleum. This would consist of rather more than two-thirds hydrogen; the remainder being carbonic oxide. The hydrogen is made up of that furnished by the oil gas, in addition to that from the steam. So if sufficient steam were added to convert the carbon into carbonic acid, the result would be nearly 520 cubic feet of pure hydrogen and 170 cubic feet of carbonic acid for each gallon of petroleum. The question of being satisfied with a less bulk, and with the presence of 33 per cent. of carbonic oxide in the product, or of obtaining pure hydrogen with the attendant expense of removing the 23 per cent. of carbonic acid, is one that must depend on the circumstances in each individual case. The hydrogen gas, which is non-luminous, can be used to dilute the pure oil gas, and any desired quality of gas can thus be made.

It is obvious that the process need not be carried so far as the complete decomposition of the oil gas. If this is done, the mixture will possess an illuminating value dependent on the proportion of oil gas that still remains undecomposed. In effect a carburetted water gas is thus obtained; and it is easy to conceive that, by regulating the supply of steam and oil gas, also the heat of the retorts, something like a regular and uniform quality of gas could be turned out by this means. Several processes based upon the principles above indicated have been put before the public from time to time; and that many of them have proved failures is due rather to practical difficulties than to fundamental error in theory. It will be sufficient to describe one of these processes, which has lately been introduced, both in America and this country, with some degree of success.

The Avery, or Meeze, process, as taken in hand by the Hydrocarbon Gaslight and Fuel Company, claims to solve the problem of making a fixed gas of high quality, free from sulphuretted hydrogen, carbon bisulphide, and ammonia, and therefore requiring no purification, from the cheapest kinds of oil. The yield is claimed to be 300 cubic feet of gas per gallon of oil; and there is no tar or residuals. The method as adopted at Cleckheaton is described in a local paper, and appears to consist of loading the oil gas formed by destructive distillation with as much water gas as it will carry. Steam from an ordinary boiler is passed through superheaters, placed above the retorts and heated by the waste heat, and thus raised to such a temperature that it will instantly fire a piece of wood. It then passes through aspirators, which serve to draw in a regulated amount of oil, and a quantity of air may also be admitted. The mixture passes through the retorts, which are formed of 4-inch cast-iron pipes, and are filled with deflectors, which force every particle of the gas into contact with the heated surface. The oil is thus entirely converted into gas; and any excess of carbon is taken up by oxygen from the steam or from the air, and formed into carbonic oxide. The steam is decomposed into permanent gas. The only subsequent process is the cooling of the gas, and any liquid separating from it in the coolers is returned to the retorts. An exhauster is used to draw the gases through the retorts. Any hydrocarbon fluid, including coal tar or its products, may be used with this system.*

Professor Wagner gives the results of some experiments on refined petroleum, freed from products boiling below 300° Fahr.† The vapour was conducted through a red-hot porcelain tube packed with broken pumice, and then to a condenser. Part of the vapours condensed, but there was a residue of gas. When the retort in which the petroleum was heated had reached a temperature of 550°, the experiment was stopped. One-third of the liquid was found in the retort, one-third in the condenser, and the remainder passed off as gas. The following particulars were ascertained:—

	Specific Gravity.	Boiling Point.	Carbon per Cent.	Hydrogen per Cent.
Petroleum used . .	0·789 ..	Over 300°	.. 85·7	.. 14·3
Left in retort . . .	0·830 ..	do.	.. 85·2	.. 14·8
Left in condenser . .	0·780 ..	Over 230°	.. 83·0	.. 17·0

The composition of the petroleum originally used is exactly the same as that of olefiant gas. The residue in the retort was a mixture of petroleum with paraffin, and the composition of that in the condenser was similar to pentane (C_5H_{12}). In addition to the liquid, there was a deposit of carbon in the retort.

Keim found that gas produced in Hirzel's apparatus from petroleum refuse consisted of 17·4 per cent. of olefiant gas, 58·3 per cent. of marsh gas, and 24·3 per cent. of hydrogen. Of these the marsh gas contains only 75 per cent. of carbon; so there was evidently a considerable deficit of carbon probably deposited in the solid form. Professor Wagner prepared some petroleum gas by passing vapours of petroleum through an iron tube 30 inches long, heated to a bright red heat, packed with pumice-stone. Gas so obtained contained 5 per cent. of acetylene, and 36 per cent. of olefiant gas; the remainder consisting chiefly of marsh gas. So it would appear that the petroleum is first converted into olefiant gas, and that the acetylene and marsh gas are formed later, according to the reactions—

$$(1)\quad C_2H_4 = CH_4 + C$$
$$(2)\quad (CH_4)_2 = C_2H_2 + H_6$$

The bulk of gas obtained was 10 per cent. greater than if the petroleum had only furnished olefiant gas. If the gas were entirely decomposed according to the first equation, the bulk would remain the same, but there would be a large deposit (43 per cent. of the original liquid) of carbon; if according to the second equation, the volume would be doubled, and there would be no further deposit of carbon. This goes to explain the larger volumes of gas obtained by the use of high temperatures; but the volume has never been found so large as to show

* See JOURNAL, Vol. XXII., p. 684.

* Details of the apparatus, as patented by Professor Meeze, will be found in the JOURNAL, Vol. L., p. 883.

† See JOURNAL, Vol. XXVII., p. 21.

the complete conversion of the marsh gas into acetylene. So in practice it is probable that a part of the olefiant gas escapes decomposition, and that both reactions obtain, to a varying extent, with regard to the remainder.

Some experiments were made with a naphtha of ·676 specific gravity, which contained hydrocarbons boiling at 86° besides considerable quantities boiling up to 100°. It was composed of 83·3 per cent. of carbon and 16·7 per cent. of hydrogen—a composition similar to that of pentane. The vapours were passed through the tube above mentioned, heated to redness, and afterwards through a condenser cooled with snow; the gas also being collected at freezing-point. The yield of gas so obtained was larger than that from petroleum, and the quality was excellent. But the naphtha required great care in handling, in order to avoid risk of fire and explosion.

Professor Wagner also tried some experiments with tar from Saarbruck coal as a gas-making material. The coal yields about 5 per cent. of tar, consisting of from 2 to 10 per cent. light, and 20 to 30 per cent. heavy tar oils; the remainder being pitch. From 100 lbs. of crude tar, 143 cubic feet of very poor gas were obtained. A similar quantity of light tar oil yielded 131 cubic feet of gas equivalent in quality to poor coal gas. The heavy coal tar oil yielded 342 cubic feet of good quality gas per 100 lbs. Considerable quantities of gas could be obtained by treating the tar with steam; but the illuminating value was *nil*. The author accounts for the small yield from the light oil, which consists largely of benzol, by the assumption that the benzol is not decomposed by the temperature obtaining in the tube. Hydrocarbons of the benzol class are therefore not easily transformed into gas; but all hydrocarbons may form benzol at high temperatures.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

THE ANNUAL MEETING.

In the JOURNAL last week we gave a general report of the proceedings at the above meeting (which was held in the Memorial Hall, Manchester, on the previous Saturday), together with the first portion of the Inaugural Address of the President for the year—Mr. Walter W. Hutchinson, of Barnsley. We to-day complete our report by giving the remainder of the address, and the supplementary paper read by Mr. Isaac Carr, of Widnes, on the Dinsmore process, with the further remarks made on this subject. The conclusion of the address will be found in another column; and the following is Mr. Carr's additional contribution on

THE DINSMORE PROCESS.

I wish, before the discussion on my paper is resumed, to describe the method of applying the Dinsmore process to existing beds of through retorts. This arrangement, which was incidentally referred to at our last meeting, has been for some months past in successful operation at the works of the Huyton and Roby Gas Company, designed by, and under the charge of Mr. F. Pritchard, the Manager.

From the diagrams it will be seen that the ordinary ascension-pipes are intersected and connected together by the collecting chamber D, which is fitted with valves C to prevent the back-flow of gas from the other retorts when each is being separately drawn and charged. The end of the collecting chamber is connected to the "duct" E. The duct (which may be set either at the apex of the arch or in between the two arches, as shown on the diagram) is made of cast iron; and the diaphragm E, which runs to within 8 inches of the back end, is cast in solid. The course of the gas in the duct, as indicated by the arrows, is from the mouthpiece along the under side of the diaphragm, up the opening at the back, along the top side, and through the water-jacket G to the hydraulic main. At J it will be noticed that the seal on the small dip-pipes leading direct from the retorts is greater than the seal on the pipes of larger diameter leading from the duct; so that the greater pressure on the small pipes causes the whole of the gas from the retorts to pass through the duct on its way to the hydraulic main. It is necessary to open the duct once a day to remove the pitch which condenses in, and runs down the water-jacket pipe; and to do this the valve C, which separates the duct from the collecting chamber, must be closed—the gas meanwhile passing to the hydraulic in the ordinary way. As the conductivity of iron is about thirty times greater than that of fire-clay, a temperature of from 700° to 800° Fahr. is found to yield the best results in the iron duct, whereas in the fire-clay duct double this temperature is necessary. The temperature of the iron duct being thus comparatively low, only a portion of the waste furnace gases from the setting are required to maintain the heat. Further, it will be seen that, with the temperature not exceeding a very dull red, the life of the duct must be of many years' duration. The cost of applying this system is about £6 per mouthpiece.

At the time of reading my paper three months ago, I was in the unfortunate position of not having any very satisfactory data to submit as to the analysis of the tars; but, in the interval, our tars have undergone separately exhaustive analyses by Professor Watson Smith, of University College, London, and by Mr. W. R. Chester, Engineer of the Nottingham Gas-Works.

Professor Watson Smith reports as follows:—

Report on Tars, marked "A" and "B," received from the Widnes Local Board Gas-Works, December, 1889.

	Per Cent. by Weight. A. Surplus Dinsmore Tar.	B. Ordinary Tar, One-third Dinsmore.
Water	1·1	7·1
Light oils	1·3	5·4
Creosote oils	16·5	17·8
(Rich in naphthalene);		
Anthracene oil	12·1	8·6
Pitch	69·0	61·1
Specific gravity of tars	1·157	1·150

Light Oils.

Per Cent. by Volume. A. (Sp. gr. = 0·930).		B. (Sp. gr. = 0·923).
Below 100° C.	4	4
From 100° to 120°	14	11
,, 120° to 130°	16	14
,, 130° to 150°	20	27
,, 150° to 175°	18	150° to 180° 24
,, 175° to 195°	14	180° to 185° 7
Residue		Solidified naphthalene.

Creosote Oils.—These contain somewhat over 50 per cent. of naphthalene. Specific gravity of oils after the separation of naphthalene: A = 1·030; B = 1·025.

Carbolic Acid.—This was chiefly found in the creosote oils. The light oils were also extracted. A contains 2·5 per cent., B contains 5·4 per cent., of crude carbolic acid.

Anthracene.—Tar A contains 0·79 per cent., tar B contains 0·32 per cent. of real anthracene. The anthracene from A was obtained without any coking of pitch; that from B was only obtained by "drawing upon," and therefore coking the pitch.

These results are quite in accordance with thoory. It is clear that phenols (as in B) have been drawn upon in the superheating process, for the formation from them of benzene hydrocarbons. It is probable that the increased anthracene is also in part due to the reduction of higher phenols. The benzene in A has been doubtless considerably drawn upon, along with some of the other benzene hydrocarbons, by the gas generated; the illuminating power becoming increased. It is, in any case, clear that A, as a tar, is but little behind B in point of value. The lower specific gravity of B would indicate what is indeed found to be the case—viz., that B is richer in naphthas than A, and contains less crude anthracene.

Pitch from "A" and "B" obtained under like conditions, and consisting of "Hard Pitch."

A PITCH.

Tensile strength = 150 lbs. per square inch

Action of Heat: Softens at 67½° C.; Twists ,, 71½ ,,; Melts ,, 94 ,,

B PITCH.

Tensile strength = 132½ lbs. per square inch

Action of Heat: Softens at 68° C.; Twists ,, 72 ,,; Melts ,, 96 ,,

The foregoing results represent pitch of good quality. To distil a tar and leave a useless pitch would mean a false result as regards the pitch, and also as regards the comparison of the products. The determinations are also comparable with the results of the processes as carried out in the tar distillery on the large scale.

(Signed) WATSON SMITH, F.C.S., F.I.C.,
Lecturer in Chemical Technology, University College, London, &c.

Mr. W. R. Chester reports as follows:—

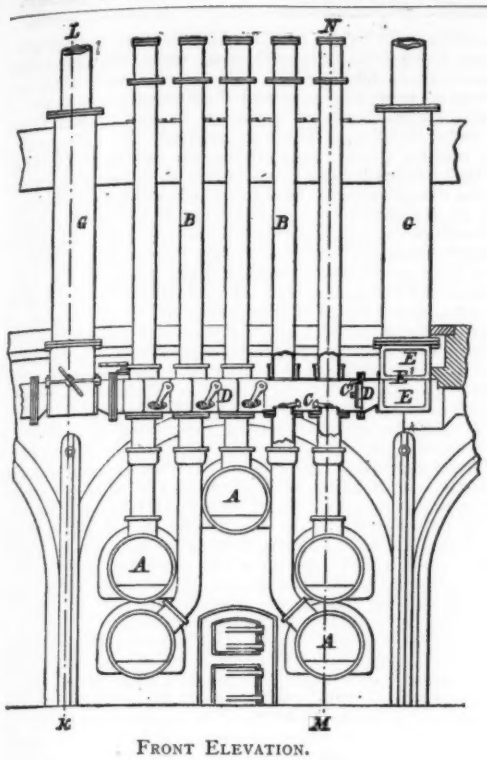
Analysis of Tar from the Widnes Gas-Works (February, 1890).

	A. Surplus Dinsmore Tar.	B. Tar from Well, consisting of one-third Dinsmore, and Two-thirds Ordinary.
Specific gravity	1·168 at 60° F.	1·154 at 60° F.
Fixed carbon	20·20 p. ct.	20·90 p. ct.
Products of Distillation—Percentage by Weight.		
Water	1·956	2·766
Crude naphtha	1·265	4·675
Light oil	1·751	3·125
Creosote	30·728	30·444
Anthracene oil	16·480	16·450
Pitch	49·820	42·540
Specific Gravity (Water=1).		
Water	1·003 at 60° F.	1·004 at 60° F.
Crude naphtha	·943 ,,	·913 ,,
Light oil	·978 ,,	·978 ,,
Creosote	1·030 at 110° F.	1·007 at 110° F.
Anthracene oil	1·110 ,,	1·130 ,,
Pitch	1·344 at 60° F.	1·343 at 60° F.
Percentage Distillate by Volume.		
Crude naphtha	14·50 at 120° C.	42·0 at 120° C.
Light oil	9·00 at 160° C.	8·5 at 160° C.
Percentage of Fixed Carbon.		
Pitch	58·9	37·66

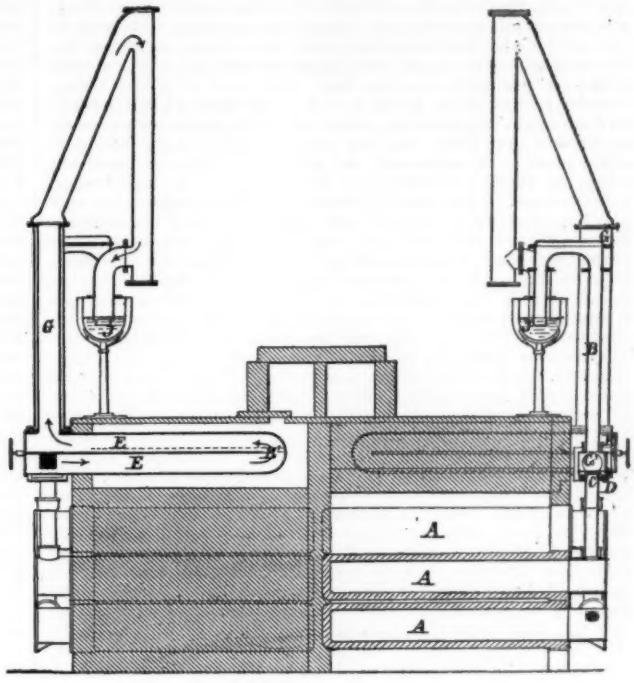
NOTE.—Twisting-point above 100° C. in both samples.

Tar.—There is little difference in the specific gravity of the two tars; the Dinsmore being slightly the heaviest. A (Dinsmore) gives 191·78 gallons per ton; B (ordinary) gives 194·11 gallons per ton. The Dinsmore sample contains a rather less percentage of fixed carbon and water than the ordinary tar. In both samples the percentage of water is much the same as in ordinary samples of tar which have been allowed a decent time for settlement.

* See JOURNAL, Vol. XXXV., pp. 407, 439, 515.



FRONT ELEVATION.



SECTION THROUGH K L. SECTION THROUGH M N.

Naphtha and Light Oil.—There is a marked difference in the yield of crude naphthas and light oils from the two tars :—

	Crude Naphtha. Per Cent.		Light Oil. Per Cent.
A—Dinsmose	1·265	..	1·751
B—Ordinary	4·675	..	3·125

There is also a marked difference in the yield of benzol from the crude naphtha distillate: A, 14·5 per cent., B, 42 per cent., at 120° C. The distillate from the light oils is practically the same—viz., 9 and 8·5 per cent. respectively at 160° C.

Creosote and Anthracene Oil.—The yield of creosote and anthracene oils is almost identical in the two tars, though they vary somewhat in their specific gravities; the creosote being heavier, and the anthracene slightly lighter in the Dinsmore than in the ordinary tar. The yield of anthracene cake extracted from the oil is 50 per cent. higher in Dinsmore than in ordinary tar.

Pitch.—The Dinsmore tar yields about 5 per cent. more pitch than the ordinary tar. The percentage of fixed carbon is also high in the pitch from the Dinsmore tar. The twisting-point of the pitch in each case is over 100° C.; and to make the samples into "medium soft" commercial quality, twisting at 60° C., a certain proportion of creosote oil and anthracene strainings would have to be used.

The main difference, from a commercial point of view, in the value of the two tars lies in the deficiency of crude naphthas and light oils in the Dinsmore sample, and in the percentages of the distillates obtained from them. At the prices of benzol now ruling, the difference in values of the tars is somewhat greater than it would have been (say) twelve months ago. Assuming the makes of tar to be constant, and similar to the samples submitted for analysis, and taking the products at their respective current values, ordinary tar afterwards mixed with one-third its bulk of Dinsmore tar would be depreciated in value about 13 per cent.—*i.e.*, the mixture would be worth about 13 per cent. less than the ordinary tar. Assuming the value of ordinary tar to be 30s. at the works, then a mixture of one-third Dinsmore and two-thirds ordinary tar would be worth 26s. per ton.

(Signed) W. R. CHESTER, Nottingham.

The foregoing analyses, together with the analysis of the gas made by Professor Foster,* show the theory of the Dinsmore process to be, in the main, a simple one—namely, the free hydrogen in the ordinary gas combining with the light oil gases of the tar, and thus forming heavy hydrocarbon gas. The tar analyses are of further interest, inasmuch as they prove that the surplus tar from the Dinsmore process, although deprived of its light oils to a considerable extent, is of fair commercial value as compared with the ordinary tar.

I am indebted to our retiring President, Mr. Ball, for directing my attention to two omissions in my financial statement. The first is that I have not debited the Dinsmore process with the interest on additional capital and wear and tear on the retorts required to carbonize the 1087 tons extra weight of coal used. This extra coal, it will be remembered, is required in consequence of using an inferior quality, yielding a less quantity of gas. This debit amounts to £44 5s. 6d. The second omission is in respect to the extra 14 tons of sulphate of ammonia produced. I have credited the process with this at its gross value, £12, instead of £8, the net value. The deduction on this account amounts to £56. The two items make a total of £100 5s. 6d. to be deducted from the balance set down as £1758 13s. On the other hand, the £57 17s. 4d., the sum the process is debited with on account of the inferior quality of the surplus Dinsmore tar, has proved to be rather more than is necessary. Half this amount would more fairly represent the difference in value of the ordinary and Dinsmore tar.

The statement in my paper relating to the illuminating power of the Dinsmore gas,* should be 21½ instead of 20½ candles.

Professor WATSON SMITH, who was then called upon, said he should like to direct attention, in the first place, to what appeared to be a little difference in the results obtained by Mr. Chester and himself, and to indicate some slight modification of the verdict given—or at all events involved—in Mr. Chester's report on the comparative value of ordinary and Dinsmore tar. Mr. Chester had drawn very considerably from the pitch. He (Mr. Smith) never saw figures representing so small an amount of pitch in tar distilled; in fact, he seemed to have coked the pitch to a very considerable extent. As a rule, the pitch ran to about 60 per cent. Of course, when the pitch was coked, it was rendered useless as pitch, unless there was an arrangement to run creosote oil into it again. In a recent analysis which he made of some pitch, the twisting-point was 68° Fahr.; so that if pitch twisted at 100° Fahr. it could readily be understood that it would be too rigid. Again, the makers of artificial alizarine who used crude anthracene, did not like it to have been obtained at a sacrifice of the pitch, because it consisted then of bodies which were costly to eject, and did not contain much crude anthracene. His analysis showed 0·79 per cent. of real anthracene in the Dinsmore tar, against 0·32 per cent. in the ordinary tar. He thought this showed very clearly that while it possessed less naphthalene than ordinary tar, the Dinsmore tar had a considerable increase of anthracene. Therefore they should take some account of the fact that while the oils suffered by being robbed of the light oils—benzene and the benzene hydrocarbons, and so on—at the same time there was a considerable increase of anthracene. Of course, it was a commercial question whether the loss in benzenes was made up in anthracene. That was a question of relative cost; but, at all events, there was some compensation. He had had occasion to make an analysis of some tar taken directly from the duct at a temperature of 350° Fahr. The specimen showed that there was an entire absence of the primary light oils, and scarcely any of the secondary light oils. These would be carried forward, and would condense at a lower temperature. What was left behind in the duct was a product containing a very large quantity of anthracene, and scarcely any naphthalene. Now naphthalene was looked for at this high temperature; and he thought it must have been carried forward by the light oils—the anthracene, which was the least volatile, being left behind. The sample contained 2·8 per cent. of water; the light oils were practically *nil;* the

* See JOURNAL, Vol. LIV., p. 1063.

* See JOURNAL, Vol. LIV., p. 1062.

heavy oils, 1·7 per cent.; creosote oil, 14·6 per cent. (sp. gr. 1·04); anthracene oil, 25·9 per cent.; pitch, 55·0 per cent. Strange to say, in the anthracene oil, and also to a certain extent in the creosote oil, there was a very large amount of crude carbolic acid—5·1 per cent.—in the tar. This was very interesting, because he had never before heard of any attempt being made to fractionate the tar in the course of its formation, so to speak. It showed that there was just the possibility in the future of some process or apparatus by which the different products might be tapped directly from the retort or the condensing arrangement. The crude anthracene in the Dinsmore tar was excellent both as to quantity and quality. It was far superior when obtained from ordinary coal, as in this case, than when cannel was used, being almost entirely free from the objectionable paraffins. When paraffins were present, the process of converting it into alizarine for the turkey-red dyers was rendered more difficult and involved loss. He also received a specimen of Dinsmore tar from Mr. Pritchard, Manager of the Huyton and Roby Gas-Works. The specific gravity of this tar was 1·13. When distilled, it gave below 120° C., 0·6 per cent. of ammoniacal liquor (which effectually disposed of the question of water as a special constituent of Dinsmore tar); below 180° C., 10·6 per cent. of light naphtha; below 200° C., 2·1 per cent. of second light oils; below 250° C., 1·8 per cent of second light oils; below 300° C., 20·9 per cent. of heavy oils, and creosote oil containing naphthalene; above 300° C., 22·3 per cent. of thick yellow anthracene oil of about 1 per cent. strength, giving about 0·22 per cent. of anthracene on the tar. As the distillation, owing to the small bulk of the sample, was carried out in glass, not so much anthracene oil was taken off as would have been possible in an iron still. Naphthalene began to separate from those oils which distilled at from 260° to 270° C. The crude carbolic acid obtained by treating the light and heavy oils with alkali was about 4 per cent., and appeared very good. The light naphthas above obtained were treated with sulphuric acid and alkali, after extracting the phenol, and rectified. The following fractions were obtained:—

Temperatures.	Percentages.
Below 100°	11·1
„ 120°	20·0
„ 130°	5·8
„ 150°	2·9
„ 160°	2·9
„ 170°	0·7
„ 180°	3·6
„ 190°	0·3
„ 200°	0·6

This tar was evidently rich both in the benzene hydrocarbons and carbolic acid; fairly rich in naphthalene; and containing a fair proportion, though not a high one, of anthracene. He should pronounce it a good tar. Professor Watson Smith continued: May I now be permitted to allude to some points already brought forward at the last meeting, at which I was not present. In the first place, I observed that my friend Mr. Francis Jones finds in the Dinsmore gas about 0·14 per cent. of acetylene; and he says that the acetylene in the Manchester gas does not exceed 0·05 per cent. I take it this is a decided point in favour of the Dinsmore gas; for acetylene is a gaseous substance which possesses a high illuminating value, as Mr. Jones indicated in another communication. But besides this, the presence of acetylene is an indication that the process, as a tar-forming process, is in a healthy condition; for acetylene is a benzene-producing gas. The French chemist and *savant* Berthelot has shown that if acetylene be heated in a glass tube over mercury to dull redness, it is converted into benzene — $3\ C_2H_2 = C_6H_6$. It also plays an important part in the formation of toluene, of the xylenes, and probably of anthracene. Let me now pass on to that part of Mr. Carr's paper, read at your last meeting, where he commences to describe the Dinsmore process as it was and as he has modified it. The great difficulty in such a process as passing crude gas, or oils, or tar, through red-hot tubes, is that either thick semi-coked pitch is formed in them, or soot, or coke; and the tubes thus become choked. There, in my opinion, is the merit of the Dinsmore process as modified by Mr. Carr—that, by means of several devices which he has arranged upon the apparatus, this choking-up difficulty is practically overcome. The idea of passing either crude oils, tars, or crude gases through extra-heated pipes or retorts is old, certainly; and I have found a patent nearly as far back as 1830 on the subject, at the time when there was no sale for tar to speak of, and the desire was to convert all the tar into gas, if possible. None of these processes succeeded; and I am bound to say that the insuperable difficulty in all of them was the choking-up or, let us say, coking-up difficulty. But a process is not a process until it can be worked. It is in a chained-up condition; and he who unchains it is an inventor. I must now pass on to the part of Mr. Carr's paper where he shows that a common coal—a steam coal from the St. Helen's district, ordinarily yielding about 9000 cubic feet of 15-candle gas—is made by the Dinsmore process to yield 9800 feet of 20-candle gas. We are thus led to another fact—viz., that the crude gas obtained is from a new source, a different variety of coal from that usually employed for gas making. I have recently shown, in a paper read before the Society of Chemical Industry, that the products vary considerably even when different varieties of actual gas coals are used;* and here we have a case in which common coals or steam coals are employed. Nevertheless, using the gas-making temperatures, this difference for such common coals will be and is only one of preponderance and diminution of one or several of the usual constituents of ordinary gas tar as sold in the market to tar distillers. There is no doubt the differences of common coal (by which I mean those not usually employed for gas making) will lead to as considerable differences in the proportions of the constituents of the tars, when these coals are carbonized, as the differences of gas coals and cannels. I have obtained a little evidence in this direction already in the case of the Dinsmore process. But let us ask, What are the results of increased heat, or rather a prolonged red heat, on the vapor-ized products of the gas-retort? The direction is one and the same in all cases—viz., to the breaking up, decomposition, or resolution of the more complex hydrocarbons and carbon compounds into less complex and more simple forms; in the direction, in fact, of an ultimate resolution into carbon (soot, coke), carbonic oxide, and hydrogen. This is, however, a stage—a kind of ideal stage—never reached. However, the products indicated are there, and increase with increased heats, because there are some carbon and hydrogen compounds more easy of such ultimate resolution than others. But such bodies as marsh gas, benzene, naphthalene, and many of the aromatic bodies, with the paraffins, are not easy of such resolution, and are comparatively permanent. With the paraffins, we have almost nothing to do; for at gas-making heats they play but a subordinate part. Such a hydrocarbon as acetylene is, as already mentioned, of great interest; and so are the olefines. They give illuminating power, and they easily unite or coalesce to produce aromatic substances, on the presence of which in the tar its value depends. Well, then, one tendency of "Dinsmorizing"—I mean, passing the crude gas through a heated duct—is to generate simpler and hence gaseous products on the one hand (such as CH_4, H, &c.), and simple and hence solid products (such as char or coke) on the other. And so we find it; for Mr. Carr has to provide a means of getting rid of pitchy remains and coked residue, as well as obtaining more gas. We all know that the final gas from a retort charge is very rich in hydrogen; and Mr. Tervet, of the Clippens Oil-Works, in Scotland, based on this fact a process for increasing his yield of ammonia, by turning the final products from a finishing retort into one that had only been working for an hour or so, in order to supply hydrogen to the nitrogen contained in the semi-charred fuel. Let us suppose, then—and we do this with facts before us—that hydrogen and marsh gas, and a few other gases of higher illuminating power but of simpler form, are increased at the expense of the higher and more complex forms, which deposit as their *débris* some gas coke or pitchy matter. Let us now ask: But whence comes or can come higher illuminating power? While not pretending to give you all the sources of this supply, I will point to some. We have seen that, where you have acetylene with a high temperature, you can scarcely fail to have benzene; and, in conjunction with other hydrocarbons, acetylene acts as a link in a chain, as in the case of anthracene. But the phenols in a tar are also resolved by prolonged heat in the gas-retorts, and therefore in passing through the Dinsmore process, so as to yield corresponding aromatic hydrocarbons, as well as other hydrocarbons. In the Dinsmore duct we may consider the vapour of phenol or carbolic acid being brought into contact with the red-hot carbon-lined sides of the retort, and with the hot atmosphere of the retort filled with heated particles of carbon. (What is said of carbolic acid is true also of other phenols.) What takes place is simply this: The phenol is reduced to benzene, thus—

$$C_6H_5\,OH + C = CO + C_6H_6.$$

I have recently proved it by passing carbolic acid through a tube containing red-hot charcoal, when I obtained a light oil, which on rectification yielded pure benzene free from any thiophen. Cresol, in like manner, yields toluene. This, then, clearly indicates what takes place in the Dinsmore duct: Whilst more simple permanent gases of slighter illuminating power are being generated, highly illuminating gases and volatile liquids are being reduced from phenol and cresol, to carburet them; and the total result is a larger volume of gas of higher illuminating power. It might be said: "But do you call that mixture a permanent illuminating gas?" Certainly it is—just as permanent as your ordinary gas; for, as Mr. George E. Davis has so fully proved, if you treat any coal gas with refrigerated oil, and so remove the benzene, you get a flame burning almost like that of a Bunsen lamp, and almost without light. Hence a certain amount of benzene vapour forms for the practical gas maker a permanent gas. But another fact comes to the front as the result of my investigations of the tars sent me. The Dinsmore product, though reduced in phenols and middle oils, is enriched in anthracene and the benzene family. As regards anthracene, I can prove this in a very striking way; for look at the differences between tars A and B (Dinsmore, and ordinary with one-third of Dinsmore)—first as regards the anthracene oil as to quantities, and secondly as to the anthracene contained as to proportion—and you will see how enriched in anthracene the Dinsmore tar (A) has become. Crude phenol (phenol and cresol) may in the gas-retort also form anthracene. Köhler has proved

*See JOURNAL, Vol. LIV., p. 1109.

this. Probably in this reaction two molecules of cresol and one molecule of phenol react, thus—

$$C_6H_4\begin{Bmatrix}CH_3\\OH\end{Bmatrix}+\begin{Bmatrix}CH_3\\OH\end{Bmatrix}C_6H_4 + C_6H_5OH = C_6H_4\begin{Bmatrix}CH\\|\\CH\end{Bmatrix}C_6H_4 + C_6H_6 + 2H_2O$$

But some will say: How can you have benzene or benzene hydrocarbons increased, and yet get less light oils? Just in this way: You are not striving for tar but for gas; and you have increased gasifying efficiency and prolonging of the action of high temperature, and the most permanent gases have carried off your volatile hydrocarbons which would constitute "light oil" (see the Huyton tar which was collected and *condensed* close to the duct). Let me gather up now my evidences as to the tar as well as I can. The Dinsmore tar, then, made from such coal as Mr. Carr uses, I consider a commercially valuable one. I am obliged to say, however, "made from such coal as Mr. Carr uses," because another coal might have given a somewhat different result. Moreover, I must even then qualify my statement by adding that it is made in this sense—that whilst the light oils are diminished, the anthracene is largely increased; and that the quality of that anthracene is very fine. It is, in short, very free from the paraffins present when cannel tars are the source of the anthracene. We may put it thus in the case of tars from such coal as Mr. Carr uses: The anthracene in the tar is more than doubled, and it is of excellent quality; whilst the light oils are reduced to from one-half in some cases to one-fourth in others. The phenol also suffers some reduction and must be sought for chiefly, as in the case of the London tars, in the creosote oils. It is not phenol (carbolic acid) that suffers so much decomposition as the higher phenols and hydroxy-phenols, which are less stable. As regards the water in Dinsmore tar, I find no difficulty whatever; for on standing in a warm place, or merely on standing, separation takes place. In short, Dinsmore tar is just as easy to dehydrate as any other. On placing ordinary tar and Dinsmore tar together, and letting them settle under the same conditions, on distillation I found 1·1 per cent. of water in the Dinsmore product, and 7·1 per cent. in the ordinary tar containing one-third of Dinsmore tar. I am informed that the sample of tar sent by Mr. Pritchard, of Huyton, was derived from a condensation of crude gas taken off near the duct and cooled. This, of course, would yield a special tar, such as a tar distiller or benzol rectifier would like; but those light naphthas, though they admirably illustrate to us that to obtain the benzenes in the tar is only a question of condensation in the case of Dinsmore tar, are by such special condensation lost to the gas.

Discussion.

The PRESIDENT asked for a clear definition of the difference between the two kinds of tar referred to in the tables. One was described as "Dinsmore tar," and the other as "Ordinary tar." Were they to understand that the former was tar derived wholly and solely from the Dinsmore process, and the latter tar made in the ordinary process of manufacture, or did it contain any admixture of Dinsmore tar?

Mr. CARR explained that the Dinsmore tar was obtained by the Dinsmore process. The ordinary tar was from a well containing one-third Dinsmore and two-thirds ordinary tar. The fact was clearly explained in the headings of the different columns as given in his paper.

Mr. T. B. BALL (Rochdale) said Professor Watson Smith had mentioned carbolic acid, and given the percentage by weight or volume of the carbolic acid contained in the tar. Did he mean ordinary commercial carbolic acid, or the total phenols found in the tar? The difference was important.

Professor WATSON SMITH said the carbolic acid referred to was what would be known in the trade as a moderate specimen of crude carbolic acid; it contained cresol, and would doubtless contain other phenols. It would, no doubt, be too abundantly extracted to come up to the standard; but he was sure there was still an extraordinary quantity of good carbolic acid present in tar B.

Mr. BALL said he was very glad that more light had been thrown on this question of the tar by the remarks which had been made that day. In the former discussion on the subject, it was stated that the Dinsmore tar contained 10·3 per cent., and the ordinary tar 4·1 per cent. of water; while Mr. Newbigging gave them another analysis in which the water was 1·6 per cent. Now Professor Smith gave them an analysis showing only 1·1 per cent. of water in Dinsmore tar. This was an instance of the difficulty of comparing the analyses of samples taken at different times. On the previous day he had a sample from the tar-well at the Rochdale Gas-Works tested for water, and it contained only 0·8 per cent. It was true it was taken from near the bottom of the well; and as there was a considerable quantity of tar in it, they had a very dry sample. Another sample taken a foot from the surface gave 3·5 per cent. There was something in the point to which the President called attention; for it really appeared that what was termed ordinary tar had been—he had better not say depreciated, but diluted by the addition of one-third from the Dinsmore process. Still there was no difficulty in working out the composition of ordinary tar apart from any admixture of Dinsmore tar. He made it out to be as follows:—Water, 10·11 per cent; light oils, 7·45 per cent.; creosote, 18·45 per cent.; anthracene, 6·85 per cent.; pitch, 57·15 per cent. The same tar taken at different times would give varying results. From the sample of his own tar which contained only 0·8 per cent. of water he obtained 10·7 per cent. of light oil, and 18·37 per cent. of creosote oil. Of the light oil they had 6 per cent. at 120°; and an additional 5 per cent. at 160°; making only 11 per cent. at 160°. From a sample taken a week before, they obtained 3 per cent. at 120°, and an additional 13 per cent. at 160°. The same coal was used all the time; and the only difference in the samples was that they were obtained on different occasions. He asked Professor Smith as to the quantity of carbolic acid, and whether or not he meant ordinary commercial carbolic acid, because the quantity of it which was described as ordinary tar was equal to 5·4 per cent. Now this meant 11 gallons of carbolic acid per ton of tar—a result which he should say had never before been contemplated. The anthracene in the ordinary tar was exceedingly low—0·32 per cent. Calculated on ordinary tar, without any admixture of Dinsmore tar, this gave only 1¾ units, as compared with 15¾ units in Dinsmore tar, which was a result that could scarcely have been anticipated. So much, however, depended upon the way in which the samples were taken; and they might vary from time to time so much as to make comparison almost impossible. For instance, a sample containing 10 per cent. of water must necessarily give a very different result from one containing only 1·1 per cent. He thought, however, that he should like to call attention to the extra yield of carbolic acid, and to the fact that the yield of anthracene was three or four times as much as was found in the tar resulting from the ordinary process of carbonization.

Professor WATSON SMITH said Mr. Ball had called attention to a very important matter as to the testing of tar. When tar contained a considerable quantity of water, the tendency of the water in passing over was to carry with it the light oils. Two tars, perfectly identical, would thus give very varying results if definite precautions were not taken. The only thing to do, after getting the naphtha in each case, was to further test it by fractional distillation or otherwise, and then the results could be relied upon. This had been done. With regard to the carbolic acid, 5·4 per cent., he believed that from 5 to 9 or 10 per cent. of crude carbolic acid was considered the usual thing. About 0·35 per cent. of anthracene was the usual quantity in tars not distilled at high temperatures. The only other tar he knew of which contained 0·79 per cent. was that obtained from the Simon-Carvès coke-ovens, with which very high temperatures were employed. It should be remembered that what had been called "ordinary tar" was actually a tar obtained in the ordinary way from an extraordinary coal, and would thus be likely to differ from (say) a cannel tar.

Mr. T. NEWBIGGING (Manchester) observed that the analysis of the tars by Professor Watson Smith was very interesting and instructive. In looking at it on the surface, without going deeply into the chemical question, it appeared to him that it pointed to the fact that a portion at least of the increased illuminating power of the Dinsmore gas came from the 50 per cent. of naphtha contained in the creosote oils. There was less creosote oil, and therefore less naphtha, in the Dinsmore tar than the ordinary tar; and it appeared most reasonable to conclude that the balance had been converted into permanent gas of high illuminating power. Of the carbolic acid 54 per cent, had also vanished from the Dinsmore tar. The bulk of the increase, both in production and illuminating power as it appeared to him, evidently came from the conversion of 75 per cent. of the light oils, such as benzene, into permanent gas; the difference in the yields being 5·6 and 1·3 per cent. This appeared to him to be the practical outcome of Professor Watson Smith's analysis of the two tars; and it was a solution of the question whence came the higher illuminating power and the increased production derived in this process.

Mr. N. MEIKLEJOHN (Longwood), who was next called upon, said he was very anxious not to state anything about the process that day because unfortunately he had had to give it up for the present; and he would rather have heard the views of men who had been more successful than he was. His failure was not due to any defect in the process; and he hoped in a few weeks to recommence using it. He found a considerable increase in the illuminating power; but, owing to sufficient precaution not having been taken to control the temperature of the duct, and also to the horizontal position of the main leading from the water-jacketed pipe of the duct to the foul main, this horizontal portion—and it alone—filled up very rapidly with solid pitch. This was so hard that they had actually to take the pipe down before it could be removed; and they could not even cut it out with a chisel. These stoppages became so frequent and annoying, at a time when the whole of the retorts were required to be in full work, that he was reluctantly compelled to discontinue working the process for the time being, until he could deal with the difficulty by replacing the horizontal pipe with an inclined pipe, falling at a considerable angle into the water-jacketed pipe of the duct, and by taking steps to obtain complete control over the temperature of the duct. As this seemed to be the chief cause of failure or success in the working of the process, he should like to have heard the discussion more particularly applied to this phase of the subject, rather than to the value of the tar, which would settle itself ultimately amongst those who were most interested in it commercially. Referring to the arrangement shown by Mr. Pritchard, he (Mr. Meiklejohn) would like to have heard more reference to it, and particularly how the graduated temperature

of the duct, which the Dinsmore people stated was necessary to their process, was maintained, as the plan did not show how the duct was kept hot where the gas entered, and cooled off towards the outlet. With clay retorts, the graduation of the temperature caused considerable difficulty in the way of cracks; for the result of keeping them hot at the back and cool at the mouth was unequal expansion and contraction. The retort consequently became fractured, and the gas went up the chimney. However, this was a difficulty which, in the setting of his next retorts, he hoped to overcome by more completely isolating the duct with brickwork and flues to admit hot or cold air and completely control the temperature, or, if need be, by replacing the clay duct with an iron one. In his design for working the process, there was, however, no loss in any temporary or, in fact, in complete stoppage of its use, as all the retorts, including the duct, could be used for charging in the ordinary way and on an improved system; and they were doing this now at Longwood.

Mr. F. PRITCHARD (Huyton) said that the design shown in the drawing occurred to him in consequence of failures similar to those of which Mr. Meiklejohn had spoken. The arrangement presented itself to him when using the process the Dinsmore people originally designed. He lost the carbonizing power of the centre retort; and he also had some difficulty in keeping the heat regulated, owing to the retorts being set back to back. Under his present arrangement, there was no difficulty. The heat was blocked off from the upper part of the duct; and there was quite sufficient heat on the lower side of the diaphragm to produce the required heat on the top side. He found that the best results were obtained when the effluent gas from the duct was at a temperature of 800° or 900°; while, if he allowed the heat to play all round the duct, there was a considerable deposit of carbon in the upper chamber. The temperature underneath the duct was a dull red heat, and nothing more; and by using an iron duct, there was not the same liability to loss by leakage. He did not care to work with an anti-dip; and he had turned the gas into the hydraulic main. But anyone who liked to have an anti-dip could run the pipe straight into the foul main; and the whole of the dip-pipes, except one large main, would be dispensed with. As Mr. Carr had mentioned, the conductivity of iron, as compared with fire-clay, was as about 30 to 1; so that nothing like the same amount of heat was required as when they heated fire-clay from the outside. With reference to cleaning out, he only performed this operation once in two days; and there was no great accumulation even then. Previously, when he had a similar style of erection to Mr. Meiklejohn's, he found the same defects as mentioned by him. As to the sample of tar which Professor Watson Smith had analyzed, a large quantity of the light oils was to be accounted for by the amount of severe condensation to which the gas was subjected. He had used the setting which was illustrated for above three months without any defect whatever, and with ordinary gas coal had made gas as high as 23 candles. It might go as low as 18 candles; it seldom fell lower than that. He was quite satisfied that he could make gas of an average of 19 candles.

Mr. W. WOODWARD (Bury): What volume per ton?

Mr. PRITCHARD: I am not in a position to say, as I am making only one-fourth by this process; and it goes with the other gas. Certainly, I am making no less. Theoretically you are bound to have a greater quantity, and practically I believe that you will get it.

Mr. T. DUXBURY (Darwen) remarked that, though not quite in the position of Mr. Meiklejohn in having to give the process up, he had nevertheless met with considerable difficulty in working it. He had encountered some of the difficulties which Mr. Carr had foreshadowed. At Darwen they had a 12-inch foul main behind the hydraulic main; and the pipe which joined the jacketed pipe went up 7 feet 6 inches, and sloped down towards the 12-inch main. The difficulty he had experienced was that, when the gas came down towards the foul main, and then went straight across to the hydraulic main, it sometimes got entirely choked up. To obviate this he had ordered a fresh casting—avoiding this straight pipe; and in addition to this he was making a new arrangement of hydraulic main. As to the quality of the gas, he had had it up as high as 23 candles, and even 24 candles, for coal only. This was as shown on one of Sugg and Lowe's jet photometers, which could be looked at at any time; but he had tested the gas as high as 22½ or 23 candles on the bar photometer. Any increase of quantity, he did not find. It seemed very strange that, while one day he could have gas of 22, 22½, or 23 candles, the next day it might be down to 16 candles. He could not at all tell why this was; and he had communicated with the Dinsmore people, whose representative had been over and seen the plant working. He believed the main difficulty he had to contend with was in the regulating of the heat of the duct. At the beginning he had the heat too high, so as to "roast" the gas as it passed through, and thus destroy the illuminating power. His opinion was that the diminution in the illuminating power always occurred when he had the duct at the greatest heat. Now, however, he had made arrangements for reducing the heat by choking up the flues all round the duct, which was in the centre of the setting; and he had had more constant results since he did this. Still he did not get the results which he anticipated realizing after he had had a little more experience and with the new casting he had ordered. He was sorry that he could not give more information; but during the time that he had hoped to devote to this matter he had been confined to his house. The details of the tar and its various constituent parts which gave the extra illuminating power, or the extra quantity of gas contended for in this process, he was unable to say anything about. In his case he had tested the gas after it had passed through the whole apparatus. One point he ought to mention was that the pipe leading from the retort-house to the rest of the apparatus was of such length, in consequence of the situation of his retort-house, that, with the small quantity of gas he was making (only one through oven, with twelve mouthpieces) he had over-condensation. He did not see that he had any means of checking this except by jacketing the pipe or waiting for warmer weather. Owing to the severity of the weather during the winter months, the condensation in this long pipe had been rather excessive.

Mr. CARR, who was then called upon, said he did not think there was very much in the discussion to which it was necessary for him to reply. He said all he had to say at the outset; and no one had asked any additional questions. Of course, it was clearly understood that the stoppages in the pipes at Mr. Meiklejohn's works arose from the water-jacketed pipe being horizontal, instead of being placed at an inclination. This was also why the stoppages occurred at Darwen. The low make of gas per ton of coal to which Mr. Duxbury had referred might be accounted for by the fact that his was a new apparatus, and the retorts were not tight. Certainly, when he saw the plant a few days previously, the duct was not tight. Mr. Duxbury, as he had told them, had not been able to go to the works and look into the matter; and perhaps some gas had escaped instead of going into the holder.

Mr. BALL: What is the length of the inclined pipe?

Mr. CARR: Six feet; and I have a jacketed pipe which is also 6 feet. The temperature of the gas at the station meter at Darwen was very low. It was taken at 35°.

Mr. BALL: But this is permanent gas.

Mr. CARR: Yes, the gas is permanent.

Mr. BALL: The gas is permanent, but the illuminating power is not.

The PRESIDENT said it seemed to him that they had not yet ascertained the principles, which required to be thoroughly understood. One point which ought to be taken into account was the analysis of the gas itself; showing whether it was olefiant gas or benzol. He begged to propose a vote of thanks to Mr. Carr for his valuable paper.

Mr. BALL, in seconding the motion, said he did not remember a paper being submitted to them which contained more amplification of detail or had more authority in its support than that which they had been discussing. One regretted one's inability to "tackle," at a moment's notice, such distinguished authorities as Professor Foster or Professor Watson Smith. He did not mean to infer that there was anything in the figures but what was right; but there might be points which one would like to have better explained, though they could not be pointed out at the moment. The paper was an admirable one; and Mr. Carr had done his best to explain the various points in connection with the process, and to make it plain to every member of the Institution. So far as his (Mr. Ball's) observation went, the difficulties in the way of its application appeared to be in the stoppage of the outlet pipes; and if they had all been reduced to this, the members must admit that the obstacle was anything but insuperable.

The resolution was carried.

Mr. CARR, in reply, said he was very much obliged for the vote of thanks. He felt that he did not deserve all the kind things the members had said of him; but if he had succeeded in elucidating the various doubtful points in connection with the process, he was very glad. Thanks were due, he thought, rather to Professor Watson Smith than to himself for the several matters of great importance which he had brought before them.

The discussion on Mr. T. Newbigging's paper on "The Utility of Water in Gas Manufacture," contributed to the previous meeting, was further adjourned and the business ended.

The members took tea together at the Star Hotel, and afterwards the health of the President and one or two other toasts were cordially drunk.

Private Bill Legislation.—A Bill has been introduced by the Hon. Arthur Elliot (Roxburgh) for establishing a Commission to examine and report upon Private Bills. The measure is practically the same as that brought forward by the late Mr. Craig-Sellar last year with a like object.

The Chairmanship of the Sevenoaks Water Company.—Mr. W. J. Thompson, who has held the position of Chairman of the Sevenoaks Water Company for nearly 25 years, has resigned his seat at the Board. Mr. D. Reed succeeds him in the chairmanship; and Mr. Sidney Thompson has been elected to fill the vacancy in the directorate.

The Late Mr. Christian Allhusen.—The value of the personal estate of the late Mr. Christian Allhusen, of the Newcastle Chemical Works and of Stoke Court, Bucks, J.P. and D.L., who died on Jan. 13 last, in his 85th year, as recorded in the JOURNAL at the time, has been sworn at £1,126,852. The deceased gentleman was one of the Directors of the Newcastle and Gateshead Water Company.

MR. W. W. HUTCHINSON'S INAUGURAL ADDRESS.

Read before the Manchester District Institution of Gas Engineers, Saturday, March 1.

(*Concluded from p.* 387.)

With respect to the electric light, I am sure I cannot do better than refer you to the admirable and practical address delivered recently by Mr. John West, M. Inst. C.E., the President of the Manchester Association of Engineers, which gives a great amount of detailed information of a valuable character on the present position of electric lighting matters. Mr. West's comparisons of the cost of electricity and gas are very much in favour of the latter, and show that, taking the average present price of gas in London, Manchester, and Aberdeen, and using the best ordinary burners, an amount of light can be obtained from gas at a cost of 10s. 10d. which, with electric lighting, costs the sum of 43s. 9d.; and that the cost of the light is reduced to 5s. 5d. by using even the ordinary types of regenerator burners. The example he gives of the cost of lighting a bank in London with electricity (using accumulators) is interesting. All details are given; and he shows the distinct advantage a customer has in supplying himself as against taking a supply from an electric company. By this and several other examples, in detail, Mr. West establishes his opinion that the most economical and satisfactory way of producing and supplying electricity to the consumers will be by gas-engines on their own premises; thereby avoiding large outlay in building, besides being able to dispense with the cost and maintenance of electrical mains and meters. The conclusion arrived at by Mr. West—viz., that many establishments may supply themselves with electric light by gas-engines and dynamos of their own, is quite the reverse to what is the case with gas-works.

The introduction of the electric light, as heralded by the Paris Exhibition of 1878, and the Crystal Palace Electric and Gas Exhibition a few years later, would not have produced the effect it did on the shareholders of gas companies had they been as well informed then as they have now the chance of being. Millions of money have been invested in electric lighting, and, I may also say, a very large amount of money has been hopelessly lost in the earlier stages; and you may yet look in vain in the list of electric companies for a single clear example, in this country, of a dividend earned by a company simply supplying the current. One company is certainly doing well in the sale of lamps; but, so far, they all seem to be successful exactly in order as they keep to the sale of apparatus. In America and on the Continent, this is not so, which is not to be wondered at when the average prices obtained there are considered.

By some, the incandescent electric light is considered a perfect light; but the researches of M. Lubinsky, communicated at a recent congress of Russian physicians, demonstrates the injurious effect of the electric light upon the eyesight of those exposed regularly to its influence; with the probable result that it will in schools, colleges, &c., have to give place to gas consumed in high-power burners. The warning, also, of Mr. J. J. Hissey, who, writing to the *Standard* recently, cautioned the public against placing incandescent electric lights in close proximity to water colour paintings—as he found, after three years' experience, that it was sufficiently powerful to cause some of the colours to fade, in a greater or less degree—will probably lead to the restriction of its use.

The electric light works have no immunity from the charge of being nuisances, as shown by the complaints about "horrible smell" at Eastbourne and other places, and serious annoyance from vibration of machinery. As to the deaths, fires, &c., caused by electricity, the matter is before you every day in the Press; and a dreadful record it is.

The changes introduced in the conditions governing the powers of the electric light companies, by the Act of 1888, have had a marked effect in stimulating the proposed establishment of electric installations; and the clauses facilitating the granting of Orders by the Board of Trade to a company to supply electricity to the inhabitants, in case the corporate authorities do not supply their requirements in the stipulated time, have been the source of an untold amount of trouble and work to the corporate officials—not forgetting the cost to the very many local authorities who were called upon to decide, at very short notice, whether they would undertake it or let some company step in. On the one hand, they had the example of the prosperity of the gas-works under their notice, and the fear of losing something in case that, after all, electricity proved a success. On the other hand, the information procurable showed that at present it was an unprofitable venture; and they were loth to spend the necessary money. This state of uncertainty has been, in many cases, compromised by undertaking small experimental installations, or by applying for powers in their own right, in order to sub-let them to some selected electric company. The advice of Mr. Hammond, the electrician, on the caution that should be shown by a corporation on this question, is very much to the point, on account of the well-defined conditions of gas manufacture and distribution, when compared with the uncertainty and changes in electrical supply.

I cannot help thinking that gas undertakings could supply electricity cheaper than anyone else, owing to the large amount of heat that now, of necessity, goes to waste in the works, and utilization of the management and officers generally. But the chief barrier to this course being adopted in England is public prejudice, which credits the profession with the intention of simply doing only sufficient to protect the gas interests. This view, I am afraid, will meet with considerable support in consequence of the statement recently made at Bradford by Mr. Alderman Priestman, that, as the electric supply had really been undertaken in protection of their gas-works, it was only right that the loss of about £1000 on the electric supply should be made good out of the gas profits. In America this prejudice seems to be almost non-existent; for I find that 237 American gas companies supply electricity.

In the matter of capital outlay per candle power produced, the electricians have, I think, no advantage over us; and this, as you know, is a great matter—the expense on that score in gas-works being almost the chief item.

I now proceed to show how our friends, the electricians, have affected the prosperity of the gas undertakings by their operations. They have had almost unlimited capital at command, and any amount of influence and encouragement bestowed upon them. Still, I venture to assert that their operations have done no injury to our industry, but rather the reverse. In proof of this, I give comparative statements of gas consumption in London, Paris, Berlin, Philadelphia, and Brussels; showing in every case a substantial increase.

London. Year.	Gas Made. Cubic Feet.	Paris. Year.	Gas Made. Cubic Feet.	Berlin.
1889	27,463,618,000	1888	10,513,793,900	Annual increase for five years, over 5 per cent. per annum.
1888	26,494,173,000	1886	10,079,956,790	
Inc.	969,545,000 = 3·6 per cent.	Inc.	433,837,110 ÷ 2 = 1·15 per ct.	Last year, 7·5.

Philadelphia. Year.	Gas Made. Cubic Feet.	Brussels. Year.	Gas Made. Cubic Feet.
1888	3,209,874,000	1888	667,700,797
1887	3,154,842,000	1884	552,342,362
Inc.	55,032,000 = 1·7 per cent.	Inc.	115,358,435 ÷ 4 = 5·2 per cent.

Through the courtesy of the respective engineers, I am now enabled to submit details showing what the results have been in those towns—viz., Leamington, Barnet, and Taunton—where electric companies have been at work for some years. I give them separately, as the classification is slightly different.

Comparative Statement of Working at the Barnet District Gas and Water Company's Works during the year 1887, *without the Electric Light, and the Year* 1889, *the Second Year of Public Lighting with the Electric Light at High Barnet.*

—	Year ending Dec. 31, 1887.	Year ending Dec. 31, 1889.	Remarks.
	Cubic Feet.	Cubic Feet.	
Gas consumed by those who have partially adopted the electric light—			Electric lamps first lit in Sept., 1888.
Public-houses . .	87,600	45,800	Only one private consumer at a public-house.
Gas consumed by public lamps displaced by the electric light—			
4 Bray's & Sugg's	223,300	—	
98 ordinary . .	1,134,600	—	
Totals . . .	1,445,500	45,800	Cub. Ft. Dec., 1,397,700
Gas made in the year .	56,576,000	59,282,000	Inc., 2,706,000
Gas sold in the year—			
Private consumers .	46,549,800	51,382,000	Inc., 4,832,200
Public lamps. . .	4,218,700	3,304,000	Dec., 914,700
Totals . . .	50,768,500	54,686,000	Inc., 3,917,500
Gas rental—	£ s. d.	£ s. d.	£ s. d.
Private consumers .	10,447 14 2	10,292 7 0	Dec., 155 7 2
Public lamps. . .	1,045 0 7	776 10 8	,, 268 9 11
Total year's rental. .	11,492 14 9	11,068 17 8	Dec., 423 17 1
Price charged— To private consumers	4s. 6d. per 1000 ft.	4s. per 1000 ft.	With reduction of 6d. per 1000 feet.
For public lamps—	£ s. d.	£ s. d.	For lamps lit at average dusk, and put out at average 12.30.
High Barnet Loc. Bd.	2 18 0	—	
East Barnet ,,	3 0 0	—	
Valley ,,	3 0 0	—	
	2 17 6	—	
Amount paid by Local Authority for public lighting—			
For gas. . . .	330 15 0	6 10 6	
For electric light .	—	383 8 0	71 lamps, at £5 8s. each.

Comparative Statement of Working at the Leamington Gas-Works during the Year 1886, without the Electric Light, and the Year 1889, the Third Year of Competition with the Electric Light.

—	Year ending Dec. 31, 1886.	Year ending Dec. 31, 1889.	Remarks.
	Cubic Feet.	Cubic Feet.	
Gas consumed by those who have partially adopted the electric light—			
Private houses (2).	233,500	35,100	
Municipal Bldgs. .	898,400	431,600	
Theatre Royal. .	712,200	839,000	
Shops, banks, hotels, &c. (20) .	3,442,600	2,951,600	
Totals. . .	5,286,700	4,257,300	
Gas consumed by public lamps displaced by the electric light—			
7 Bray's & Sugg's	327,657	—	
3 special . . .	96,355	—	
50 ordinary . .	617,669	—	
			Cub. Ft.
Totals . . .	6,328,300	4,257,300	Dec., 2,071,000
Gas made in the year	140,017,000	153,998,000	Inc., 13,981,000
Gas sold in the year—			
Private consumers .	118,470,500	133,277,800	Inc., 14,897,300
Public lamps. . .	12,905,900	13,058,000	,, 152,100
Totals . . .	131,376,400	146,335,800	Inc., 14,959,400
Gas rental—	£ s. d.	£ s. d.	£ s. d.
Private consumers .	15,836 15 3	16,285 8 3	Inc., 448 13 0
Public lamps. . .	1,805 1 0	1,676 4 3	Dec., 128 16 9
Total year's rental. .	17,641 16 3	17,961 12 6	Net in., 319 16 3
Price charged—			
To private consumers per 1000 cub. ft. .	2s. 8d. to 3s. 2d.	2s. 6d. to 3s.	Reduced to 2s. 4d. to 2s. 10d., Oct. 1, '89.
For public lamps .	2s. 7d.	2s. 5d.	Reduced to 2s. 3d., Oct. 1, '89.

Comparative Statement of Working at the Taunton Gas-Works during the Year 1886, without the Electric Light, and the Year 1889, the Third Year of Competition with the Electric Light.

—	Year ending Dec. 31, 1886.	Year ending Dec. 31, 1889.	Remarks.
	Cubic Feet.	Cubic Feet.	
Gas consumed by those who have partially adopted the electric light—			* 166,500 cubic feet off this quantity consumed in gas cookers, decrease 154,100 cubic feet; or adding the above 166,500 cubic feet, 320,600 cubic feet.
Shops, banks, hotels, &c. . .	2,374,700	*2,120,600	
Gas consumed by public lamps displaced by the electric light—			
Siemens . . .	260,000	—	
Ordinary . . .	430,000	—	
			Cub. Ft.
Total . . .	690,000	—	Dec., 690,000
Gas made in the year .	53,829,600	55,056,000	Inc., 1,226,400
Gas sold in the year—			
Private consumers .	46,371,600	50,381,300	Inc., 4,009,700
Public lamps. . .	3,685,100	2,549,500	Dec., 1,135,600
Totals . . .	50,056,700	52,930,800	Inc., 2,874,100
Gas rental—	£ s. d.	£ s. d.	£ s. d.
Private consumers .	7,920 1 10	8,583 10 0	Inc., 663 8 2
Public lamps (gas only)	622 16 1	432 4 11	Dec., 190 11 2
Total year's rental. .	8,542 17 11	9,015 14 11	Inc., 472 17 0
Price charged—			
To private consumers per 1000 c. ft. . .	3s. 4·91d.	3s. 4·83d.	Average.
For public lamps .	3s. 0·00d.	3s. 0·00d.	
Amount paid by the Corporation for public lighting—	£ s. d.	£ s. d.	
For gas. . . .	765 2 9	667 14 1	Including lighting, extinguishing, and repairs.
For electric light .	—	652 10 0	Total for gas and electric light in 1889, £1320 4s. 1d.

From the foregoing data, it will be seen there is a decided increase in the total quantity of gas sold, although the amount consumed in public lamps is, in the case of Barnet and Taunton, decreased; but this latter is at the cost of a very large additional expenditure by the lighting authorities, as the following table of cost at Taunton shows:—

During the year 1886	£765	2	9
,, 1887	1406	17	9
,, 1888	1395	19	8
,, 1889	1320	4	1

Gas only. Gas and electric light.

In 1889, the lighting by gas was cut down below the previous meagre standard, in order to pay for the extravagant cost of electricity.

As to the dissatisfaction, or otherwise, of the inhabitants of the places cited, I refer you to their local Press. Coming to a Yorkshire town—viz., Bradford—we find that the Corporation have put down an installation at a present cost of £26,000, and have power for 5000 16-candle power lamps. But as the buildings, and boilers, &c., are large enough for extensions, it is estimated that £40,000 will accurately represent the capital for running 10,000 16-candle power lamps, even for supplying the most central part of Bradford. Gas is 2s. 3d. per 1000 cubic feet, less discounts from 2½ to 12½ per cent.=2s. to large consumers. Electricity is supplied, at present, at 5d. per Board of Trade unit; and this is equal to gas at about 5s. per 1000 cubic feet; the renewal of lamps bringing up the total charge to three or four times that of gas. An advance of 2d. per unit has been suggested to cover the loss now sustained. None of the establishments in Bradford have been bold enough to dispense with gas altogether; indeed, they could not do so, as the electric supply is only given from dusk to 11 p.m. As a commentary upon the above, the Cardiff Corporation have recently shown their faith in gas by proposing to buy the gas-works there at 27 years' purchase.

Coming nearer home, I may state that the Barnsley Corporation are seeking powers to light up a part of the town—selecting, of course, only a small area, and that the most compact and best-paying portion. But how those outside that area will sit down under their portion of a probable cost of fully £48,000 or £50,000 (in case underground wires are used), simply for the better advertisement of those inside the area, I cannot say. How would it be received were a gas company to propose to light up only the best-paying portion of the town, and leave the remainder? In passing, allow me to recall events at Chesterfield, where electricians lighted the streets for over two years, at considerable loss. Where is it now? It is gone; and the Corporation are paying 3s. 3d. per 1000 cubic feet for all gas supplied to the lamps.

In engineering, the most original departure from what has been customary is in spiral-guided gasholders, as illustrated in a thoroughly successful manner at Northwich, where a holder in accordance with Messrs. Gadd and Mason's patent has been erected by Messrs. Clayton, Son, and Co., Limited, of Hunslet. The holder is 60 feet in diameter, with two lifts of 20 feet each, and was erected under the inspection of our respected member, Mr. Thomas Newbigging. For a full description I refer you to the various gas journals, and content myself with stating that it is a solid fact that the holder at Northwich is doing regular duty, and stands uninjured in the least degree in spite of severe storms. I am informed by Mr. Gadd that the larger the holder, the greater the proportionate saving will be; and that an extra lift can be added to a holder just as easily as building a new one. Messrs. Gadd and Mason are, in fact, ready to advise and do this in all cases where the framing is strong enough to stand the extra strain under wind pressure resulting from such added lift. Mr. Gadd also says that holders on this system have greater stability than the ordinary guided ones. Tilting being an impossibility, snow need never be interfered with, but left to thaw. I give Mr. Gadd's statement, because I believe that you desire all the information that can be obtained about this system of holder construction. The saving in price by adopting this system is estimated at fully 15 to 25 per cent., or even 30 per cent., after allowing for royalty. The wire-rope system, patented by Mr. Pease, is another instance of change in gasholder construction. An example of this is to be seen at the Haslingden Gas-Works, where, under the direction of Mr. W. H. S. Gendall, an inner lift has been added to an 80-feet holder; Messrs. Ashmore, Benson, Pease, and Co., Limited, being the contractors.

I think it is now generally accepted by engineers that machinery for charging and drawing retorts will be more extensively employed in the near future. In connection with this subject, I may now call your attention to the erection of machinery at the Beckton Gas-Works for dealing with 810 mouthpieces, on the steel wire-rope system, recently improved by Mr. John West, and may say it is considered the most perfect example of mechanical stoking machinery yet introduced. Coze's system of inclined retorts is attracting a large amount of attention, and trials are being made, or are to be made, at London, Birmingham, Brentford, Burnley, and other places. It is to be hoped that the system of continuous carbonization, of Mr. J. Elliott, of Ludlow, now about to be practically tested at Birmingham, will prove successful, as it is a step in the right direction. I am of opinion that the Dinsmore process of making gas is worth our careful attention and Mr. Isaac Carr, to whom on this matter we owe thanks for his able and painstaking, and it would appear, successful endeavours to elucidate and establish the principles controlling the production of gas by this method, will submit to-day a detailed analysis of Dinsmore tar. As it

is in part a question of the relative value of gas and tar, and dispensing with cannel, this information will be of great service.

To those of our members who are of an inventive turn of mind, a useful field is open in the direction of devising some practicable automatic or mechanical method of lighting and extinguishing public lamps. I am aware that many methods for accomplishing this end have been patented and tried; but I am not aware that any really successful method is in operation on a large scale. Success in this would enable us to be at very little more expense than the electricians in lighting our gas-lamps. Prepayment meters are much wanted for use by the smaller consumers; and there are now several available—including Messrs. Brownhill's, Valon's, Cloudesley's, Glover's (St. Helens), and last, but not the least available, that of Mr. Laycock, of Keighley—the last two being, let us hope, the successful inventions by our own members. The abolition of meter-rents is a vexed question in some towns; but I am of opinion that they should not be abolished.

A great impetus to gas consumption may be given by the application of the sale or hire purchase system for gas-fittings on the lines adopted by Mr. Valon, of Ramsgate, and others. Many engineers secure a great increase in the consumption of gas by bringing to the notice of the public the best appliances for lighting, heating, and ventilating, and instructing them in their proper use. In incandescent and regenerative lamps, the public may have any amount of choice, and may purchase, at reasonable rates, lamps giving five times the light they usually obtain from the same quantity of gas burned in ordinary burners. In gas-stoves, gas-fires, and all description of gas heating and cooking appliances, as well as in gas-engines, there has been very great improvement in recent years. With respect to the enormous improvements of all appliances used in connection with gas-works, I think our thanks are most decidedly due to the various inventors and makers of the same.

Tar is steadily rising in value, although not yet half the price it was in 1879. Practically there has been no increase in the value of ammoniacal liquor; but there is a great increase in the number of gas-works undertaking the manufacture of sulphate of ammonia; and this may be accounted for, to some extent, by the unreasonably heavy rate charged for carriage by the railway companies, and the improved and less costly apparatus to be had for that purpose.

Gas coke has most decidedly risen in value, but has not kept pace with the advance in coke-oven or smelting coke—the latter having more than doubled in price. The breaking of coke and its sale for domestic purposes may be followed with great advantage to most gas-works. In Barnsley we sell almost 1000 tons a year (=20 per cent.) for domestic use; delivering it in bags at the customers' residences.

Before concluding, it is but right that I should express my thanks to all those gentlemen who have so kindly supplied me with information respecting the varied subjects touched upon; and now I beg to thank you for the attentive and indulgent manner in which you have listened to these somewhat dry and lengthy remarks, and I trust that, in at least some portion of this address, you will find satisfaction and encouragement, and possibly a little food for reflection and future development.

Eastern Counties Gas Managers' Association.—The third general meeting of this Association will be held to-morrow week, at Peterborough, under the presidency of Mr. J. Barton, Engineer and Manager of the gas-works in that city. We learn from the *agenda* issued by the Hon. Secretary and Treasurer (Mr. H. Wimhurst, of Sleaford) that a proposition to admit assistant-managers will be submitted to the members, as well as the names of six candidates—one being Mr. Geo. Garnett, of Ryde, the President of The Gas Institute—for election. After the adoption of the report and accounts, the President will deliver his Inaugural Address; and Mr. W. Drewry, of Cleethorpes, will read a paper describing an "Experience with Subsided Gas-Mains." In the afternoon the members will inspect the Peterborough Gas-Works, and afterwards visit the Cathedral. The day's proceedings will conclude with a dinner at the Vine Hotel.

Death of Mr. G. H. Osborn, of Bromley.—We regret to record the death of Mr. George Henry Osborn, Secretary and Manager of the Bromley (Kent) Gas Company. When the Company was constituted in 1854, and acquired the works which then supplied Bromley, Mr. Osborn was appointed Secretary. He had consequently been in the Company's service for 36 years. Although he had not been trained for the management of a gas undertaking, he exhibited such extraordinary administrative capacity, and became so thoroughly conversant with all the details, that the business was highly successful. The first year's gas-rental amounted to about £700; and the price charged by the former proprietor was 9s. per 1000 cubic feet. Under Mr. Osborn's management, the Company outgrew the old works and erected those now in operation. At the same time they gradually reduced the price to 3s. per 1000 cubic feet; and their rental for last year was upwards of £20,000. Such progress as this, achieved under the direction of a man who was entirely self-educated in gas manufacture, is truly remarkable. The Directors have sustained a great loss by Mr. Osborn's death; and he will be much missed throughout the district, where he was very highly respected.

REGISTER OF PATENTS.

Applying Gas-Engines for Intermittent Work.—Piers, E. F., of Hulme, Manchester. No. 2144; Feb. 6, 1889. [8d.]

This invention relates to an arrangement of apparatus for overcoming the difficulty experienced in starting machinery worked by a gas-engine—especially when used to operate tram cars or machinery requiring to be frequently stopped and started. The needful combination consists of a gas-engine, a force-pump, and a secondary engine (worked by the force-pump) to propel the tram car or work the other machinery. The force-pump operates either water, air, or other suitable agent, which is conveyed from the force-pump by pipes to the secondary engine. The pipes are fitted with valves, the opening of which relieves the pressure of the fluid from the force-pump from acting on the pistons of the secondary engines. Thus, when it is required to stop the tram car or other machinery, it is not necessary to stop the gas-engine, but merely to open the valves, and so stop the secondary engine. When it is desired to start the car or other machinery, the valves are closed, and the water or other agent again acts upon the piston of the secondary engine. A further part of the invention consists in a particular mode of working the pistons of the force-pump.

Liquid Meter.—Ahrbecker, H. C., of Stamford Street, Blackfriars, S.E. No. 3293; Feb. 23, 1889. [8d.]

The chief object of this invention in liquid meters is the working of the valves which alternate the pressure on the piston in such a manner that, whether the flow through the meter be quick or slow, the stroke of the piston shall always be reversed with certainty at each extreme.

The meter consists of a vertical cylinder fitted with a packed piston, with its rod passing through packing in the cylinder cover into a closed chamber (above the cylinder cover) containing the slide-valve and the gear for working it; the whole surmounted by a chamber containing a counter with its dial and index visible through a glass at the top. The supply-pipe opens into the closed chamber, in which is arranged a horizontal slide-valve of the D kind, governing ports to both ends of the cylinder, and a discharge port in communication with the discharge-pipe. A pin projecting from the piston rod works in the slot of a link connecting it to a slot in one arm of a three-armed lever. This arm in its middle position is horizontal; and the other two arms are vertical—the one extending upwards and the other downwards, and both having rollers mounted on their ends. The roller of the upper arm moves under a wedge-shaped arm pressed down by a weight or a spring; the roller of the lower arm moving to-and-fro between two tappets fixed on the slide-rod.

The action of this valve gear is as follows:—As the piston approaches the end of its upstroke, it begins to move the three-armed lever, the upper roller of which, in passing under the protuberance of the wedge-shaped arm, raises it in opposition to the weight or spring. As soon as the roller passes the apex of the wedge, it is caused to make a sudden stroke onwards; and the roller of the lower arm is thus made to meet one of the slide-rod tappets, and move it—shifting rapidly the slide-valve. When the piston approaches the end of its downstroke, a similar action takes place, but in the opposite direction. The slide-rod carries a pawl, which at every stroke turns a ratchet-wheel one tooth (another pawl preventing the wheel from retreating). A worm on the axis of the ratchet-wheel works a vertical spindle passing through packing into the counter-chamber above, and so working the gearing of the counter.

Heating Gas-Retorts.—Bamberg, G., of Highgate Road, London. No. 5635; April 2, 1889. [8d.]

This invention has for its object to heat retorts—particularly those employed for the manufacture of water gas—in such a manner that they are maintained at a full red heat, and at the same time prevented from being heated above that point. It consists in employing as a medium for transmitting the heat from a fire to the retort, metallic zinc or other suitable volatilizable metal, maintained at the temperature at which it is volatilized; provision being made for leading off the zinc vapours as they are generated. Under these conditions, the temperature of the zinc will remain constant, no matter how much the temperature of the fire employed for heating it may rise above its vaporizing point. Thus by ensuring that the zinc is always maintained at the point of volatilization, the retort will always be maintained at the temperature essential for the manufacture of water gas. The zinc vapour as given off is led to a chamber where it is condensed at such a temperature as to re-assume the fluid metallic state; and it is then passed back into the receptacle which is heated by the fire. In order to enable the exact temperature which it is desired to maintain in the retort to be varied according to requirements, other metals that volatilize at a higher or lower temperature than zinc may be added to it in varying proportions.

Manufacture of Water Gas.—Fox, S., and Blass, E., of Leeds. No. 6531; April 10, 1889. [6d.]

This invention, relating to improvements in apparatus for making water gas, has for its object the production of the necessary steam without the use of a boiler in cases where there is no boiler already at hand. To effect this the patentees propose to heat up a regenerator by the gases produced in or by the regenerator during the time of blowing up the fuel therein; and then admit water under pressure into the heated regenerator. This, impinging upon the heated parts of the regenerator, is converted into steam, which passing through the incandescent fuel in the generator makes water gas.

Gas-Engines.—Rogers, N., and Wharry, J. A., of Terre Haute, Ind., U.S.A. No. 10,286; June 24, 1889. [8d.]

This invention, relating to gas-engines, has for its object to produce a two-cylinder engine, the connecting-rods of which operate one crank pin, the valves of the two cylinders being operated from a single-way shaft, and the speed of the engine being controlled by mechanism which will exert its influence upon each cylinder in such a manner as to throw one of them out of operation in advance of the other on attaining a speed above the normal. The explosive mixture used in

the cylinders may, say the patentees, be any fuel gas and air; but they preferably use a carburetter and manufacture the carburetted air on the spot.

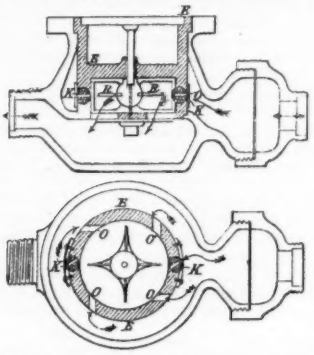
Pipe Joints for Subaqueous Use.—Brown, O., of Victoria Mansions, Westminster. No. 13,221; Aug. 21, 1889. [6d.]

This invention relates to joints for pipes intended to be laid under water, with the aid of divers, or in other positions involving difficulty in the operation of fixing and connecting the several lengths. The specification points out that in pipes hitherto constructed for subaqueous use, the spigot end of one length fits into the faucet end of the next; the two lengths being then drawn together and secured by bolts and nuts, which pass through flanges or lugs formed on the respective parts. For the bolt to be parallel with the pipe, the holes in the flanges have to be brought opposite one another; thus almost invariably necessitating, says the patentee, the partial rotation of the length of pipe in course of attachment. This invention is designed to avoid that difficulty and the loss of time which the operation entails.

Where the pipes are of sheet metal bent to shape and rivetted or welded longitudinally, or both longitudinally and circumferentially, the ends of each length are furnished with solid conical rings of spigot and faucet form respectively. Behind the conical ring upon one length of pipe is mounted a flange perforated with a number of bolt-holes. The rear end of the conical ring upon the adjoining length is somewhat flared so as to form a projecting rim or bead; the bolts, instead of being made with heads in the usual way, are formed with hooked ends adapted to engage with the rim or bead above referred to. In laying such a pipe, the conical ring backed by the annular flange is placed in or over the conical ring appertaining to the next length, and having its rear end flared. The bolts are then passed through the holes in the flange; and their opposite (or hooked) ends are engaged with the flared rim with which the next length of pipe is provided. The nuts are subsequently applied, and the whole tightened up where needful.

Meters for Liquids.—Bonne, C. R.; communicated from H. Meinecke, of Breslau, Germany. No. 19,128; Nov. 28, 1889. [6d.]

This invention consists in fixing one or more bored-through balls K in the wall of the box E of any description of liquid-meter, whether provided with turbine, wing, or other action wheels. When the liquid



has passed through the inlet, it reaches the openings O with the balls K; and by placing these balls in a suitable position, the stream of water is caused to strike the action-wheels R either at their outer edges or more towards the middle, and either at their upper or lower part. By these means the action-wheels are made to move either slower or quicker; so that, in order to regulate the speed of the wheels, nothing further is needed than to direct the stream of liquid in the proper manner against them; and the operation of regulating by either enlarging or diminishing the opening O itself is done away with.

Manufacture of Fuel and Lighting Gas.—Newton, H. E.; communicated from the Fuel Gas and Light Improvement Company, of New York. Nos. 20,980 and 20,981; Dec. 31, 1889. [8d. each.]

In carrying out the first-named invention, which relates to the manufacture of gas suitable for fuel and illuminating purposes (made in the same plant, either together or separately as desired), apparatus is employed comprising a shell or body lined with refractory material, within which is a fixing chamber containing a mass of fragmentary refractory material, with an outlet below for permanent gas. Above the fixing chamber is a converter or decomposing chamber, communicating with the fixing chamber. An injector is employed by which mixed hydrocarbon, steam, and oxygen or air, are injected into the decomposing chamber. A carburetter may be employed for rendering luminous the gaseous products from the converter before they reach the fixing chamber, but so arranged that a portion of the products may be conveyed away before being so treated.

With this apparatus, a fuel gas may be produced composed of hydrogen and carbonic oxide, but which is not a permanent or fixed gas; or an illuminating gas may be produced, composed of hydrogen, carbonic oxide, marsh gas, and carbon or illuminants. Both gases are made of variable amounts of liquid hydrocarbon, water in the form of steam, and oxygen or air. It will also be possible, say the patentees, to produce a fixed or permanent fuel gas composed of carbonic oxide, made from liquid hydrocarbon and steam; and all the operations are completed without the use of retorts or their equivalent in the form of checkerwork or similar heated surfaces. Hydrocarbon and steam may be supplied from separate apparatus or not, as desired.

The second invention consists in locating within a shell or body, preferably of refractory material, an evaporator or superheater, with an oil-supply pipe communicating therewith. Above the evaporator and superheater is a carburetter, with a communicating pipe or passage between. Above the carburetter and carbonizer is a converter or decomposing chamber in communication with the carburetter and carbonizer; and communicating with the converter or decomposing chamber, there is a passage for steam, hydrocarbon liquid, and oxygen or air, which passage is preferably in the form of an injector. There is an outlet for permanent gas through the evaporator and superheater. The carburetter and carbonizer is so constructed that it will comprise a vapour chamber and a mixing chamber, communicating with each other through passages or tuyeres. The evaporator and superheater comprise a number of tubes of refractory material (through which the highly-heated gaseous products will pass) made in sections, alternately of refractory material and metal.

APPLICATIONS FOR LETTERS PATENT.

2912.—Badams, H. H., "Improvements in gas-brackets and chandeliers." Feb. 24.

2915.—Gratrix, S., "Improvements in gas-lamps." Feb. 24.

2954.—Roots, J., "Improvements in gas-engines." Feb. 24.

2955.—Propfe, H., "An improved process of and apparatus for the continuous distillation of tars or mineral oils and their products of distillation." Feb. 24.

3081.—Kingsford, C., "Improvements in apparatus for inserting and withdrawing the charges from gas-retorts." Feb. 26.

3130.—Thomas, T. C. J., "Improvements in gas-lamps." Feb. 27.

3160.—Steenbergh, B. van, "Improvements relating to the manufacture of water gas, and to apparatus therefor." Feb. 27.

3236.—Siemens, F., "Improvements in hot air gas-lamps." Feb. 28.

3242.—Doty, H. H., "Improvements in apparatus for utilizing liquid hydrocarbons for lighting and heating." Feb. 28.

3277.—Patterson, E., "Improvements in gas-governors." March 1.

3304.—Greenhill, M. C., "Improvements in apparatus for enabling a supply of gas or other fluid, or a current of electricity, to be obtained for a limited time on prepayment therefor." March 1.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Mr. Methven's Paper on "Photometry."

Sir,—Since the discussion on this paper, which is well worthy of a distinguished place in the annals of gas literature, was concluded at the last meeting of the Southern District Association of Gas Engineers and Managers (*ante*, p. 336), after being adjourned from the previous meeting, it is now open to review. It embraces a very wide range of subjects; but the discussion principally touched upon one of these only—viz., that of photometry in connection with the action of the London Gas Referees. Although discussed at two meetings, the numerous points advanced by Mr. Methven cannot be said to have received adequate consideration. The time at disposal was limited in each case; and this probably accounts for the fact that the number of speakers—taking the discussion as a whole—was so small. Surely, had time permitted, several of the members of the Association could have advanced some information on the general aspect of the properties of gas-flames, and the effect of various atmospheric conditions upon them, as well as upon the important question of the proper air supply for gas-burners. Indeed, it is not too late to suggest that the time at the disposal of the Association, at one of their meetings, might be spent in many less profitable ways, than by discussing the paper from a gas consumer's point of view, entirely apart from the question of photometry.

Before passing from the question of gas testing, however, may I remark that the paper serves to place the subject of photometry in a fair and proper position, both before scientists and the public, and to rescue it from the rut into which it has fallen of late years. There has been a tendency to assume that the standard photometer is perfect except in one respect, and that is the unit of measurement employed—the much-abused sperm candle of six to the pound, consuming 120 grains of sperm per hour. It is of no use to accurately finish and fit any one particular part of a complicated machine, unless each and every other part has received an equal amount of attention; and the efforts that have been directed to the attainment of a perfect light-standard, to the exclusion of other points about the photometrical apparatus, leave it to be inferred that the securing of a satisfactory standard would come as a sort of finishing touch to an otherwise efficient apparatus. So much has never been asserted directly or inferentially; but it is obvious that an apparatus which will properly distinguish minute variations in different sorts of "standard lights," must in itself be practically perfect. When Mr. Methven quotes experiments showing that the position and section of the end board, the temperature and proportion of aqueous vapour in the air, the size of the chimney as compared with the special constitution of the sample of gas under observation, and so on, may all induce important variations in the recorded results, he gives a wholesome check to any tendency in the way of over-estimating or unduly magnifying the adjustment of the standard light, to the exclusion of other points. The elaborate researches made by Mr. Dibdin not long ago were all of them conducted with special apparatus, and with so much attention to every detail, that nothing advanced by Mr. Methven need shake our confidence in their accuracy. But this cannot be said with regard to other and earlier published results. While showing that some of the defects said to be due to the standard candles, which have now for some years enjoyed the position of the proverbial cat in the lodging-house, may be really the result of either one or more, singly or severally, of many other causes, the general tone of the paper is strongly in favour of a standard that shall approach nearer in point of illuminating value to that of the gas, and that shall show greater sympathy with the gas, so to speak, as regards the effect of atmospheric and other disturbing influences. The present standard consists of a solid at ordinary temperatures; whereas it appears that much more satisfactory results would follow if it resembled in physical properties the gas to be tested—that is to say, if it was a gas, somewhat similar in specific gravity, illuminating power, requirements of air for combustion, &c., to ordinary coal gas. This is especially evident in that part of the paper which deals with the changes in the position of the centre of the candle-flame due to spontaneous movements on the part of the wick during the act of combustion.

The question has frequently been asked whether, under the conditions of ordinary photometrical experiments, such variations in the properties of the air supply or in the variable constitution of the gas as compared with the rigidly-defined proportions of the burner and chimney, it might not be possible that the recorded results are affected to an extent at least of equal importance to any variations that are fairly due to the candles. Mr. Methven furnished a decisive answer to this suggestion, by showing that variations in the temperature of the air supply, the quantity of moisture present, &c., affect the quantity of light yielded by the gas in quite a different manner to that furnished by the candles. And his experiments on the adjustment of the air supply towards the quantity shown by analysis to be required, show decisively the broad effect that a poor gas is unduly depreciated, and a rich gas unduly favoured, by the standard burner.

The most important point raised in the paper is: "What is a 16-candle gas?" and it is one that is worthy of attentive examination. Rightly or wrongly, gas manufacturers regard the 16-candle gas standard, subject to certain reservations, as a fixed quantity. The question appears to be: "Are the Referees entitled to interfere with the fixed quantity?" Assuming that gas of unvarying quality is supplied from a gas-works, Mr. Methven's point is that the Referees should always return it as of that quality. Calling it, for the sake of argument, 16-candle, he contends that the Referees have no right to make any alterations or improvements in their testing apparatus that will have the effect of returning the gas as 15·5 or 15 candles. This is a matter that cuts both ways; and its reasonableness can scarcely be disputed. No honest draper would wish to put his customers off with only 35 inches of cloth to the so-called yard; but he would rightly complain if he were forced to use a measure of 37 inches to the yard, and that with no limitation as to whether a further change to 38 inches, 39 inches, or even more, might not be introduced at some future time. It is an important matter to the seller that he should not be called upon to give more than the orthodox 36 inches; and equally in the matter of the quality of gas, the standard should be kept within unalterable limits as far as possible. If otherwise, who is to define the degree of latitude to be allowed? The gas of unvarying quality may gradually depreciate in the gas examiners' returns, from 16 candles to 15, from 15 to 14, and so on to any extent. Perhaps the measure may be elastic and variable in length from unknown or unavoidable causes. But this is a different thing from subjecting it to a known tangible alteration.

Apart from the question of the rights of buyer and seller, there are several reasons why the 16-candle standard should not be allowed to vary from the metaphorical 36 inches. The results of past years' operations have been carefully recorded; and most gas engineers have collected a considerable number of statistics relative to the yield and quality of gas from certain kinds of coal, the effect of improved condensation on illuminating power, of particular systems of purification, &c. In many cases, these have been put in as official returns, and preserved for comparison, and as, in some sense, a criterion of future working. Where is the value of all these if the standard is to be altered? They would simply lead to confusion, and perhaps to unjust suspicion as to the quality of the coal supplied, or the degrees of skill and care exercised by the gas engineer.

One of the most important matters suggested by the paper, from a gas consumer's point of view, is the marked analogy between the air supply of a gas-burner as a medium for developing light, and that of a furnace as a means of developing heat. Attention has of late years been directed to the air supply of furnaces; and it has been shown that the nearer it can be made to approach the theoretical requirement, the better are the results secured. The best possible effect is obtained when there are no partially consumed products of combustion in the chimney gases on the one hand, and no excess of unused air on the other. That is to say, when the supply of oxygen in the air is exactly sufficient to secure the complete oxidization of the combustible matters. Mr. Methven brings out the interesting fact that this is true in respect to illuminating flames. If combustion were not complete, there would be some loss of illuminating effect; and any excess of air supply reduces the temperature of the flame, and with it the illuminating power. The marked connection between flame temperature and illuminating value is thus made evident.

Bringing this conclusion to the appliances by means of which gas is commonly consumed, it is evident that in all flat-flame burners, and in many Argands, there is a very important loss of illuminating value, on account of excessive air supply. Indeed, it is possible, and under some circumstances certain, that the standard burner is itself an offender in this respect. What can be said, then, on behalf of the large Argand burners, with chimneys at least 10 inches long, which are so popular for shop lights, both inside and outside, as well as for many other purposes? Even when the flame is full sized, the result can scarcely be economical; but it frequently happens that the burners are turned on only about half-way, or that, on account of small supply pipes or other hindrance, the burners only receive about half the quantity of gas they are intended to consume. The loss of light on account of excessive air supply must be very large, and must increase in a ratio larger than the inverse proportion to the decreased supply of gas. The user is just in the position of a manufacturer whose boiler furnaces are so badly arranged that an unnecessarily large proportion of the heat generated escapes and is wasted by way of the chimney. The result is that his consumption of fuel is larger than it need be, and that in proportion to the amount of waste going on. In a similar manner the user of gas is consuming a much larger quantity for the production of a given lighting effect, than would be necessary with more efficient appliances. The obvious conclusion is that if it pays a consumer of fuel for heat-producing purposes to carefully adjust and regulate the air supply to his furnaces, it will also pay the consumer of gas as a source of artificial light to look after the air supply to his lighting burners.

This also accentuates the importance of the well-known fact that every burner has a certain quantity of any given sample of gas that it is capable of consuming to the best advantage; and, further, that this quantity, whatever it may be, is only fixed in regard to one particular composition of gas. If the constitution of the gas varies, the quantity varies also. But it is evident that the further we get away from that quantity, the greater is the loss of value, and that in a proportion larger than the difference between the proper quantity and that actually being consumed. Every burner should be adjusted to consume one quantity only; and in order to secure this we must have efficient pressure regulators. And it follows that the adjustment of the quantity of light afforded by the burner, by varying the rate of supply, can only be effected at the expense of a certain amount of waste. The important results that may follow from the direction of the attention of manufacturers of burners and others, to the clear elucidation of facts like these, which at present are very imperfectly understood by the majority, can scarcely be over-estimated.

March 5, 1890. A Country Gas Examiner.

The Day of Reckoning.

Sir,—The arbitrary conduct of the great corporate gas companies in fixing the delivery of contracts for gas coal in such unreasonable quantities in the winter months, is about to recoil upon them next year with well-deserved punishment. I understand this question is very likely to be dealt with by the Federation of Coal-Owners, as there is nothing that has done more to unsettle the working miner than the irregularity of work between summer and winter. It is no uncommon thing for gas managers to require as low as 3 per cent. per month of their contract in the summer months, and as high as 12 per cent. of the contract during winter months. There can be no wonder at the collier being reduced to starvation wages under such a state of things in summer.

During the extraordinary depression in the coal trade, this state of things has been exacted; but for the next few years at least, I see that the gas companies who refuse to provide themselves with reasonable stocks in the summer, for their winter supply, are likely to have to pay seriously for their neglect. The contracts for gas coal for the last two or three years have been a very serious loss to the coal-owner, which has been increased by the fact that the heavy winter deliveries have prevented him from taking advantage of the high prices ruling for fuel for other purposes. During the past winter, many thousands of tons of gas coal have been delivered at 7s. per ton; whereas 10s., 12s., and 13s. per ton could have been obtained as house-fire coal. Now that supply and demand are more evenly balanced, it is only natural that a large quantity of gas coal will be directed to the house-fire coal trade.

It is surprising that this state of things has not been discussed, and more equitably dealt with, by the various Associations of Gas Managers in the country. It must have been well known to them that the moment the trade of the country improved, and coal was in greater demand for other purposes, many thousands of tons would be withdrawn from the gas making industry.

March 8, 1890. Equity.

The Water Supply of Felixstowe.—A Committee was appointed at last Wednesday's meeting of the Felixstowe Local Board for the purpose of considering the question of the Sanitary Authority undertaking the supply of water to the district. Power was given to them "to confer with the owners of the present water supplies and any other persons."

The Manchester City Council and the Supply of Hydraulic Power.—At last Wednesday's meeting of the Manchester City Council, Sir John Harwood said the Water Committee had received promises from 43 municipal corporations to assist them in opposing the promoters of a Bill having for its object the introduction of hydraulic power into the city. They hoped shortly to put some information before the Council which would enable them to sanction the Committee going to Parliament next autumn to obtain a Bill of their own for supplying hydraulic power.

The Public Lighting Question at Bridlington Quay.—At the meeting of the Bridlington Local Board last Tuesday, Dr. Redman, the Chairman of the Building and Lighting Committee, said he had received a telegram from Messrs. Lang, Wharton, and Down, stating that, as the Board did not accept their tender for lighting the town at the last meeting, they were not now in a position to carry it out, as they had accepted other contracts. The Board thereupon resolved that the tender of the local Gas Company should be accepted. A Committee was subsequently appointed to consider and report on the best means of lighting by electricity the whole of the district, with power to employ an electrician.

Proposed Purchase of the Derby Gas Company's Property by the Corporation.—In the course of the petition which the Derby Corporation have presented against the Bill of the local Gas Company, they say: "Your petitioners submit that provision should be made for enabling your petitioners to purchase, and for requiring the Company to sell the gas undertaking on fair terms and conditions, and that proper clauses and provisions should be inserted in the Bill for enabling your petitioners to carry into effect any such purchase. Your petitioners are the owners of the water-works and water undertaking supplying not only the borough, but also practically the same district outside the borough as the Gas Company supply; and they submit that they could if the gas-works were in their own hands, supply the district with far greater economy and efficiency than the Company has hitherto done."

The Brighton Corporation and Electric Lighting.—A special meeting of the Brighton Town Council was held yesterday week, for the purpose of receiving reports from the Lighting Committee and the Works Committee, recommending the purchase of land and buildings for an electric lighting station, and the appointment of Mr. Shoolbred, C.E., as electrical engineer. A number of petitions were presented, signed by householders in various wards of the town, in opposition to the Corporation undertaking the supply of electricity. Mr. Ewart proposed a resolution respecting the purchase of certain land and buildings for £7000, which, he said, could be used as a lighting station and store-place, and the machinery could be placed there without being a nuisance. This was seconded; but Mr. Blaker moved that the whole matter should be deferred for two months. In the result the amendment was lost; and the resolution and reports of the Committees were adopted.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Thursday, March 6.

The Baildon Local Board Bill, the Birkenhead Corporation Bill, the Dewsbury and Heckmondwike Water Bill, the Leicester Corporation Water Bill, the Mid-Sussex Water Bill, and the Morley Corporation Water Bill, were referred to a Select Committee, consisting of Lord Poltimore (Chairman), Earl Caledon, Lord De Tabley, Lord Wenlock, and Lord Fermanagh; to meet on March 11.

The Bury Corporation (Railway) Bill and the Bradford Corporation Bill were referred to a Select Committee, consisting of Earl Belmore (Chairman), the Earl of Lauderdale, the Marquis of Ormonde, Lord Zouche of Haryngworth, and Lord Saye and Sele; to meet March 13.

During the past week the following progress was made:—

Bills committed: South Lincolnshire Fen Water Bill; Ystrad Gas and Water Bill.

Bill read a second time: Newcastle and Gateshead Water Bill.

Petitions against the following Bills have been presented:—

Bradford Corporation Water Bill, from the Corporation of York, the Silsden Local Board, and Owners, &c., on the Wharfe.

Mid-Sussex Water Bill, from Owners, &c., in the Parishes of Worth, Ardingly, and Balcombe.

Newcastle and Gateshead Water Bill, from the Duke of Northumberland.

Plymouth Corporation Bill, from the Cattewater Commissioners, Ystrad Gas and Water Bill, from Trustees of the late Crayshaw Bailey and others, and the Earl of Dunraven and Mount Earl.

HOUSE OF COMMONS.

Monday, March 3.

PROVISIONAL ORDERS FOR THE SUPPLY OF ELECTRICITY.

Mr. CAUSTON asked the President of the Board of Trade whether the Board had determined, without inquiry into the circumstances of the case, not to proceed with any applications for Provisional Orders to supply electricity if the local authorities refused their consent, and thus to ignore the power vested in them by section 1 of the Electric Lighting Act, 1888, which provided for dispensing with such consent.

Sir M. HICKS-BEACH said no such determination had been arrived at. In view of the Sessional Orders of Parliament, the Board of Trade informed promoters of Provisional Orders that they could not proceed with applications unless the consent of the local authority was produced by Feb. 25. Where, however, as had already been the case, the promoters requested the Board of Trade to dispense with such consent, their applications would be carefully considered; and if there appeared to be exceptional circumstances connected with the refusal of the local authority, an inquiry would be held.

INSPECTION OF RESERVOIRS AND WATER-WORKS.

Mr. STANLEY LEIGHTON asked the President of the Board of Trade whether, in view of the increasing number of reservoirs and water-works now being built in this country, and of the danger to life and property resulting from any insufficient construction of the retaining walls, the Government would take steps to provide some system of inspection similar to that now in force with regard to railroads.

Sir M. HICKS-BEACH said that there might be danger to life and property if such works as those referred to in the question were improperly constructed; but it seemed to him that such danger would be local in its origin and defects, and wholly different in its nature from the danger possible from the improper construction or administration of railways. If it were deemed necessary that there should be statutory inspection of such works, it should be conducted by officers of the County Council rather than those of a department of the State.

During the past week the following progress was made:—

Bills read a second time and committed: Canterbury Gas and Water Bill; Clayton, Allerton, and Thornton Gas Bill; Derby Gas Bill; Hartlepool Gas and Water Bill; Newark-upon-Trent Water Bill; Whitehaven Gas Bill; Warrington Extension, Water, &c., Bill.

Petitions against the Liverpool Corporation Bill have been presented from the Corporation and owners, &c., of Bootle-cum-Linacre; the Local Boards of Toxteth Park, Walton-on-the-Hill, Wavertree, and West Derby; and the Liverpool Gas Company.

LEGAL INTELLIGENCE.

WESTMINSTER COUNTY COURT.—Monday, March 4.

(*Before Mr.* F. BAYLEY.)

Robinson and Fisher v. Satchell and Others.

A Curious Question of Water Supply.

This was an action by the plaintiffs, who are the owners of a private water supply at St. Peter's Square, Hammersmith, to recover payment for water supplied to the defendant and four other persons. It appeared from the evidence that some time ago the plaintiffs—a firm of auctioneers and estate agents—became the mortgagees in possession of a private supply of water to the houses in St. Peter's Terrace, Hammersmith. The water was supplied to the defendant and a number of others, most of whom had never disputed their liability. There were four other defendants, besides Satchell. For the defence it was contended that the defendants were only tenants of the property, and the plaintiffs had no legal claim against them. If the plaintiffs were to recover, they ought to sue the lessee and not the tenant.

Mr. *F. Miller*, the plaintiffs' Manager, was called, and said he was appointed to collect the rents and water-rates of the property in question. His employers held the deed under a mortgage, and to them the tenants were liable for the water supplied to them. They made the same charge—viz., £1 10s. a year—as was levied by the previous holder of the property; and his (witness's) books would show that some of the defendants had paid the money on previous occasions without raising any question as to non-liability.

His HONOUR said he thought the plaintiffs had proved their title to the deed, and that the defendants were liable.

Mr. *L. Johnson*, Managing Clerk to the attesting witness of the assignment, said he saw all three persons sign the deed whose names appeared thereon.

For the defence it was contended that the plaintiffs had not proved any right to levy a rate against the defendants. It was admitted that water had been supplied, but it was urged that the rate charged was very excessive.

His HONOUR said it appeared to be the rate which had been charged by previous owners of the property, and he thought the defendants were liable. He should therefore give judgment for plaintiffs.

The SOLICITOR for the defence said he hoped his Honour would not decide the case without hearing his evidence. He had in Court the original leases of the very property now in dispute, and it was distinctly laid down that the sum of £1 a year should be chargeable in respect of the water supply, and not £1 10s., as claimed by the plaintiffs.

His HONOUR, having examined the whole of the documents, came to the conclusion that the defendant Satchell was liable on the higher scale; and that judgment must be given against the other defendants for the rate at which they had previously paid.

PONTYPOOL POLICE COURT.—Saturday, Feb. 22.

(*Before Colonel* H. C. BYRDE *and Dr.* R. EDMUNDS.)

Alleged Impurity of the Pontypool Water Supply.

An application was made to-day for the appointment of a competent person to inquire into the grounds of a complaint made by certain consumers of the Abersychan and Pontypool Local Government Board Districts as to the scarcity and quality of the water supplied by the Pontypool Gas and Water Company.

Mr. T. M. PHILLIPS appeared for the Abersychan consumers; Mr. T. WATKINS, for the Pontypool consumers; and Mr. H. BYTHWAY represented the Company.

Mr. PHILLIPS said the application he had to make was of a somewhat important character, inasmuch as it affected the comfort and well-being of the community of Pontypool and its environs. It was an application for their Worships to make an order to appoint a competent person to inquire into the condition of the water-works and the supply of the town. He was instructed that complaints had been made of the condition, both as to the quality and the quantity, of the water; and under these circumstances, he made the application. He then proceeded to read the section of the Company's Act under which he was acting, and afterwards the memorial of the consumers, which concluded with the recommendation that Mr. James Mansergh, of Westminster, should be appointed to examine and report upon the works.

Mr. BYTHWAY asked for an adjournment for a week to enable the Company to investigate the state of affairs. They might, he said, be able to compromise it without troubling their Worships further.

Mr. PHILLIPS submitted that the Company had no *locus standi* to oppose the application, and there is no such provision under the section; on the contrary, it was clearly the contemplation of the Legislature that such an application should be of an *ex-parte* character.

Colonel BYRDE thought it was rather singular that Mr. Phillips should be enabled to spring a mine upon his opponents in this manner.

Mr. PHILLIPS said it was according to the Act.

Mr. BYTHWAY observed that he only received notice of the application in one case the previous evening, and in the other that morning.

Mr. PHILLIPS remarked that there was no necessity for the notice; it was entirely a matter of courtesy.

Mr. BYTHWAY said he wished to say that the section upon which his friend relied contained the word "complaint." That complaint must be founded upon information under the Summary Jurisdiction Act; so that the Company might have an opportunity of appearing in Court. This was an application for their Worships to make an order appointing an engineer to forcibly inspect the works of the Company; and he submitted, therefore, that they had a right to see that the information brought before the Court was well founded, and the application made a *bonâ fide* one. He believed he was in a position to show that it was not *bonâ fide*.

Mr. WATKINS also objected, on behalf of the Pontypool memorialists, to the Company's *locus standi*; and he pointed out that, even if the application were under the Summary Jurisdiction Act, no information was necessary. But those Acts had no application; inasmuch as the section of the Company's Act clearly pointed out all that was to be done, and the only notice to be given the Company was that by the person appointed within three days of his appointment. Moreover, the Company were guarded against frivolous applications, as, if the complaints were groundless, the memorialists were liable for costs.

Colonel BYRDE said that, by reference to the Act, he took it that the initiatory proceedings were to be *ex-parte*. But it appeared to him that there was one defect in Mr. Phillips's application—that was, that he specified or selected the person who should be appointed to inspect the works. That seemed rather one-sided; and he thought the Bench should appoint the man, who should be agreed to by both parties.

Mr. BYTHWAY objected to the application being considered *ex-parte*, and also to the nomination of the inspector by the memorialists.

Colonel BYRDE said the Bench felt that they had simply to execute a duty, and that under the Act, this being an *ex-parte* question, they had no alternative but to make the order; but the selection of a competent person they would consider and decide upon again.

[It is understood that Mr. J. Mansergh was subsequently appointed by the Bench to be the inspecting engineer, in accordance with the application.]

Sale of Stock in the Harrogate Gas Company.—Last Friday week, Messrs. Renton and Renton offered for sale by public auction, at Harrogate, £3880 of consolidated "C" stock in the local Gas Company. The prices realized ranged from £203 to £224 per cent.

MISCELLANEOUS NEWS.

THE DIRECTORS OF THE SOUTH METROPOLITAN GAS COMPANY AND THEIR WORKMEN.

Presentation at the Vauxhall Station.

As was briefly notified in last Tuesday's JOURNAL, a thoughtful and pleasing act was performed on the previous day at the Vauxhall works of the South Metropolitan Gas Company by the men employed there and at the Kennington Lane station, in the presentation to the Directors of an illuminated address which was embellished and framed in a handsome and tasteful style. At the appointed hour, the Chairman of the Company (Mr. George Livesey), the Deputy-Chairman (Mr. John Mews), Captain Heathorn, and Messrs. Robert Morton, Simpson Rostron, and J. Ewart (Directors), the Chief Engineer (Mr. Frank Livesey), and the Secretary (Mr. Frank Bush) entered the room in which the men were assembled in large numbers, and were greeted with loud cheering.

Mr. C. C. CARPENTER, the Engineer, at once addressed the Chairman, saying that he had been asked on the part of the men to hand to the Directors the illuminated address which they had before them. He did not think it necessary to say anything, as the address spoke for itself. He might, however, observe that it was a great pleasure to him to find a meeting of that kind taking place at those works; and it must be equally pleasant to the Directors to feel that once more they came not only among their employees, but among men who were their friends. He then read the address, as follows:—

To the Chairman and Directors of the South Metropolitan Gas Company.

Gentlemen,—The employees at your Vauxhall and Kennington Lane stations respectfully beg to tender to you their heartfelt and sincere thanks for the successful issue to which you have brought a struggle that at one time threatened seriously to interfere with their welfare, their happiness, and their livelihood.

They felt that the honourable and noble manner in which you have fought the battle of their freedom of action and of contract, deserves more recognition at their hands than an unspoken, though deep feeling of gratitude.

Especially are your new hands anxious to express their complete satisfaction with the arrangements you made for their comfort during the time they were housed within the works, as well as that, in the full tide of your success, you did not forget a single promise made to them before the trouble began.

They have therefore chosen the medium of this address to convey to you their appreciation of your efforts on their behalf, and their assurance that in the future, as in the past, they will spare no endeavour to serve you faithfully and well.

To your broad-minded and generous-hearted Chairman, within whose fertile brain was forged in the bonus scheme a link destined to bind together more closely and harmoniously employer and employed, they would desire respectfully to say that they share with the whole of the country its admiration for the unflinching courage and unremitting courtesy with which he has successfully carried through a scheme so much to their advantage.

Signed on behalf of the old and new hands,
WILLIAM DAVID HUNTER, Foreman.

February, 1890.

Mr. LIVESEY, on behalf of the Directors, sincerely thanked the men for their expression of kind feeling, and for the handsome address which they had had prepared. He assured them that they would be very proud indeed to have it hanging up in the Board-room as a memento, for all time, of the kindly and right feeling that existed between the Directors and their workmen in these trying times. Referring to the recent struggle, he said that it had indeed been a battle for the workmen quite as much as for the employer; as, if the demands of the Union men had been conceded, it would have taken away the liberties of their workmen. Every man would have had to work, not in accordance with those terms which he thought best or more advantageous for himself, but in accordance with the terms which certain irresponsible men chose to impose upon them. Regarding the profit-sharing scheme, as they all knew, there was no compulsion whatever to sign the agreement; every man was free to accept or reject it. But the leaders of the Union were afraid that if the scheme made headway, it would cause the men to become attached to their employers; and then they would not care much for the Union. They wanted the men to serve the Union, and not the masters; and so they opposed it. Speaking of the relations between employers and employed, Mr. Livesey said that he had been told by a Trades Unionist that the men regarded their masters as their enemies; and their chief object was to get the largest amount of wage from them, and do the smallest possible amount of work for it. If masters and men were to look upon each other as enemies, he (Mr. Livesey) was afraid that there was a very bad outlook for England; and he was convinced that the only way this great country could maintain the high position to which it had attained was by the employers and employed working closely together. He then proceeded to point out to the men the great responsibilities that rested upon a gas company, and upon all connected with it. The old stokers seemed to have ignored this altogether; but the presentation of the address indicated that the existing staff did recognize it. He reminded the men that the Directors had their duties to perform, not only to the workmen, but to the gas consumers and to the shareholders. It would always be the endeavour of the Board and the Engineers to deal justly and kindly towards the men; and at the seasons for shortening hands and re-engaging them, they would always give consideration to the claims first of their loyal men, second to the new men who came to them in their time of difficulty, and lastly to the old stokers who deserted them. He urged the men to do all they could in the way of saving money and improving their positions; and concluded by assuring them that the Directors would remember that as a red-letter day in the history of the Company.

At the close of Mr. Livesey's address, to which the men listened with close attention, three hearty cheers were given to the Directors for having personally attended to receive the address, and to Mr. Carpenter for having made the presentation.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The shareholders of this Company will hold their ordinary half-yearly meeting next Friday, when the Directors will submit a report which states that the general working of the concern during the past six months has been satisfactory, although the profit on revenue account is not sufficient to pay the dividends. Three things appear to be mainly answerable for the reduction in the amount of profit on this occasion—(1) There has been an increase in the price of coal, but no corresponding benefit has been derived from the sale of coke; (2) wages have been increased to a very considerable extent; and (3) the price of gas was reduced from 2s. 7d. to 2s. 6d. per 1000 cubic feet from and after the date of the Michaelmas quarter's accounts. The increase in the quantity of gas sold during the half year was 4·04 per cent., compared with the corresponding period of 1888. The revenue account shows that the total amount received by way of gas-rental was £47,702; and that the residuals produced £17,995—the total receipts being £66,792. The disbursements reached a total of £53,526, of which sum £27,986 was expended on coals. The balance transferred to profit and loss account is £13,266; and the amount of net profit to be carried to the next accounts, subject to the past half year's dividends, is £27,667. The dividends recommended by the Directors are at the following rates per annum:—6 per cent. on the preference stocks, 7 per cent. on the ordinary 7 per cent. stock, 10 per cent. on the ordinary 10 per cent. stock, and 7 per cent. on the new ordinary 7 per cent. shares—amounting to £13,625, less income-tax of £340.

PROVINCIAL GAS AND WATER COMPANIES.

During the past week we have received the particulars contained in the following paragraphs relating to the working (in the past six or twelve months, as the case may be) of the several Gas and Water Companies mentioned.

Gas Companies.

In both departments the business of the Accrington Gas and Water Company is increasing. During the past half year, the number of additional gas consumers was 484, and of water, 249. In the same period the expenditure on capital account was £2074—£1353 of which was for new mains and service-pipes and £517 for new gas and water meters. The profits on the six months' working have enabled the Directors to pay the statutory dividends at the rate of 10 per cent. per annum on the "A" stock, and 8 per cent. on the "B" stock and called-up shares.

The half-yearly meeting of the Aldershot Gas and Water Company was held on the 26th ult., when the report presented by the Directors stated that the business of the Company was in a satisfactory condition; and they recommended the payment of maximum dividends on the original and "B" ordinary shares (less income-tax), after providing for the interest on preference shares and stocks. The sale of gas in the town was slightly above what it was in the corresponding period of the previous year. The sale of water in the town showed the usual increase. The Board also mentioned that the parish authorities had again increased the assessment on the works; and the Local Board had given notice to oppose the Company's application to the Board of Trade. The Directors regretted the expense which would be caused thereby to the town, as the result would be to prevent any reduction in the price of gas for some time. The revenue account showed that in the six months 27,941,700 cubic feet of gas were sold, which realized £3931; and that for residuals a sum of £1323 was received. The water-rentals produced £1728. With some minor items, the total receipts amounted to £7190. Deducting from this sum the expenditure, £2209 remained to be carried to the profit and loss account. With the balance from the previous half year, the net profit available for division was £4422. On the motion of the Chairman (Mr. A. F. Wilson, Assoc. M. Inst. C.E.), seconded by Mr. A. Brown, the report and accounts were adopted.

The sixth half-yearly meeting of the Barry and Cadoxton Gas and Water Company was held last Thursday week. The Directors reported that gas was available for public use before the close of last year, and was then supplied to Barry. Owing to the continued difficulties in connection with the roads, which had embarrassed the Company throughout their operations, and caused much additional expense, the supply of gas had not yet been extended to Cadoxton. The Chairman (Mr. J. Ware), in moving that the report be approved, said the Board did not recommend a dividend, but at the next meeting he hoped they might be in a more satisfactory state. They had not been able to connect the gas supply with Cadoxton, in consequence of the Local Board not having done their duty. He might say they were taking steps to raise further capital; and the Directors proposed to call a statutory meeting to confirm it. They intended to provide for the issue of £900 of debentures, bearing interest at 5 per cent., to shareholders at par, and for £12,800 of water capital. It was also intended to offer £19,200 of gas capital (limited to 7 per cent.) for sale by tender. The report was approved.

The profit realized on the past year's working of the Eckington and Mosbro' Gas Company permitted the declaration, at the meeting of the shareholders last Wednesday week, of a dividend of 8 per cent. on the original shares, free of income-tax, and 7 per cent. on the additional shares; leaving a balance of £385 to be carried forward. In the course of the proceedings, the Chairman (Mr. F. Barber) stated that the works had been maintained in a thoroughly efficient condition out of revenue; and that the average quantity of gas made per ton of coal carbonized was 10,745 cubic feet, against 10,724 cubic feet in 1888. He alluded in high terms to the management generally.

Last Thursday, the shareholders of the Hastings and St. Leonards Gas Company met to receive the report of the Directors on the past half-year's operations. Having announced with much regret the death of their esteemed colleague, Mr. Alfred H. Wood, they stated that the vacancy on the directorate had been filled by the appointment of Mr. W. Stubbs (Mayor of Hastings). The report proceeded to point out that the condition of the Company's business continued to be satisfactory, and showed an increase over the corresponding half of last year. The exhibition of gas appliances, which was held in September last, was a

marked success. The renewal, in an extended form, of the Company's No. 2 gasholder had been satisfactorily completed, and the cost of renewing the original single-lift holder had been charged to the past half-year's revenue account. One-half of No. 1 retort-house had also been renewed, and refitted with new retort arches and fittings in place of those originally erected 25 years ago. Arrangements had been made for the ammoniacal liquor produced to be manufactured into sulphate of ammonia on the works; and this, the Board believed, would add considerably to the income of the Company. The revenue account showed that the total receipts were £30,420, of which £24,142 was received for gas, and £5216 for residual products. The disbursements amounted to £22,246. The balance of £8174, added to that brought forward from the previous half year, made a sum of £27,171; and the Directors proposed the payment of a dividend at the rate of 12 per cent. per annum on the £25 shares, and at the rate of 9 per cent. per annum on the £20 shares.

The accounts of the Leominster Gas Company for the year ending Dec. 31 last, which were presented to the shareholders at the half-yearly meeting of the Company on the 27th ult., showed a profit of £766; and the Directors recommended the payment of the usual maximum dividends for the second six months of the year at the rate of 10 per cent. per annum on the original shares, and 7 per cent. per annum on the "B" shares; leaving a balance of £330. There was only a small increase—at the rate of about 1½ per cent.—in the consumption of gas, owing, no doubt, to the mildness of the early part of the present winter. Accompanying the accounts issued by the Secretaries (Messrs. A. and D. Edwards), was a tabular statement showing the consumption of gas by private consumers for each year from 1860 to 1889 inclusive, arranged in periods of five years. In the first-named year the price was 7s. 6d. per 1000 feet, and was brought down to 6s. 8d. by 1864. In this quinquennial period the average yearly consumption was 2,897,600 feet. In the next five years, the average yearly consumption was 4,489,200 cubic feet; showing an increase of 1,591,600 cubic feet, with the price lowered to 5s. and 4s. 2d. In the succeeding period there was an average annual consumption of 5,658,800 cubic feet—an increase of 1,169,600 feet; the price in the closing year being 5s. This was followed by a gradual reduction to 4s. 2d.; the increased yearly consumption being 1,962,800 cubic feet. The price of 4s. 2d. was kept through the next five years, when the increased yearly consumption was 1,022,800 cubic feet. In the first year of the final period, the price was 4s. 2d. and 3s. 9d.; the latter figure remaining till the close. The increased yearly consumption was 1,740,000 cubic feet. The yearly consumption during the entire period covered by the return rose from 2 to nearly 11 millions.

The profit on the past half-year's working of the Lewes Gas Company amounted to £1419. After providing for interest on mortgages, the balance of net revenue, as shown in the profit and loss account, was £1767. At the meeting of the shareholders last Thursday, a dividend of 5 per cent. was declared, which will absorb £1310, and leave a balance of £457 to be carried forward.

At the recent meeting of the Ossett Gas Company, the Directors presented a report upon the work of the half year ending Dec. 31 last. This showed that in the six months the amount of gas manufactured was 30,287,000 cubic feet—an increase of 611,000 feet over the corresponding half of the previous year. The gas sold in the same period was 26,048,271 cubic feet—an increase of 490,250 feet, or 1·88 per cent. The gas made during the whole year was 57,933,000 feet, an increase of 372,000 feet; and sold, 50,080,131 feet. The revenue account showed that the sale of gas produced an additional £67; the residuals yielded £113 less, but there was more of them in stock. The balance of £1464 was carried to profit and loss account, which, after providing the statutory dividend, left a surplus of about £52 to be carried forward. It was also reported that the tank for a new 100-feet gasholder was practically completed; the gasholder itself was in the hands of the contractor, and would be ready for use next winter. The report was adopted; and subsequently votes of thanks were accorded to the Directors and the energetic Secretary (Mr. J. Castle).

The total revenue of the Shotley Bridge and Consett District Gas Company for the past half year amounted to £3627, and the expenditure to £2175; leaving a balance of £1452, out of which, on the recommendation of the Directors, dividends have been declared of 5 per cent. on the consolidated stock, 5 per cent. on the "A" capital, and 3½ per cent. on the "B" capital.

The revenue account of the South Bank and Normanby Gas Company for the past year show receipts amounting to £6392, which, with the balance from last year's accounts, makes a total of £6488. The expenditure amounted to £3459; the balance being £3029. The Directors' report states that during the year the Manager (Mr. W. Nixon) advised that the single-lift gasholder should be telescoped; and this has been successfully carried out—the contract being entered into prior to the advance in iron and wages. At the recent meeting of the shareholders, the report and accounts were adopted; and a dividend was declared of 5 per cent., which, with an interim payment of 4 per cent., made 9 per cent. for the year.

The Southend Gas Company during the past year experienced a satisfactory increase in their receipts for gas; and the Directors are hopeful of being able in the future, from the steady expansion of the business, to meet the advance in the prices of materials and labour, without increasing the price of gas. It is expected that at no distant date a further outlay will have to be made on works and plant to enable the Company to meet the growing demands of the district. It is seen from the accounts that the total revenue for the twelve months was £6421; and the expenditure £4316, which left a balance of £2105 to be carried to the profit and loss account. The balance available for dividends is £2161, from which the Directors will recommend, at the forthcoming meeting, the payments of the statutory dividends. In October last an interim dividend was paid, amounting to £680; and they now suggest the payment of £970, which will complete the yearly maximum dividends, and leave £443. From the latter sum, it has been resolved to transfer £250 to the reserve fund, and the balance of £193 is to be carried forward.

In submitting the report of the Directors at the annual meeting of the Tunbridge Wells Gas Company last Wednesday week, the Chairman (Mr. W. H. Delves) congratulated the shareholders on the satisfactory position of the Company. There was, he said, a steady increase in the consumption of gas, although the rental was proportionately less, owing to the fact that last year the Directors found it possible to make a reduction of 3d. in the price charged to the consumers. Alluding to the completion of the Company's new gasholder, he complimented the contractors on the admirable way in which the work had been carried out. He also spoke of the loss the Company had sustained by the death of Mr. R. P. Spice, their Consulting Engineer. The Directors' report was adopted; and the full statutory dividends were declared.

Water Companies.

The Chairman of the Chichester Water-Works Company (Alderman W. Smith, J.P.) had a very favourable account to give to the shareholders, at their recent meeting, of the working of the concern during the past half year, under the management of Mr. Arthur Barton. During the past three half years, the receipts for water had been as follows:—For the half year ending December, 1888, £1188; June, 1889, £1208; and December, 1889, £1206. The profits for the past six months amounted to £735, which, with the sum of £940 brought forward, made £1675, out of which an interim dividend of 8s. 9d. per share on the fully-paid up shares, and of 7s. per share on the partly paid-up shares (£8 paid) free of income-tax, was declared in August last, amounting to £829. This was paid; and a balance of £846 now remained applicable for distribution. The Directors, therefore, recommended that similar dividends be declared; making 8¾ per cent., free of income-tax, for the year. This payment would absorb a sum of £829. The Directors' report, with the recommendation as to dividend, was adopted.

During the past half year, the gross revenue of the East Warwickshire Water Company from house property was £520, and from meter supplies £230—giving a total of £750. The average daily consumption of water was about 80,500 gallons.

Although the district covered by the East Worcestershire Water Company is a large one, it is sparsely populated, and the progress of the concern is slow. At the recent meeting of the shareholders, Lord Windsor submitted the Directors' report for the past half year, which indicated that the issue of the additional capital having been completed, the agreed abatement of £5 per share on the 956 new shares allotted—viz., £4780—had been carried to the capital expenditure account. The net profit was £424, which, added to the balance brought forward from the last account, £671, made a disposable balance of £1096. The report was adopted; and it was decided not to pay an interim dividend, but to carry the whole amount forward to the next accounts, to be dealt with after June 30 next.

At the half-yearly meeting of the Leatherhead and District Water Company last Thursday week, the Chairman (Mr. H. Rokeby Price) submitted for adoption the report of the Directors on the six months' working. This stated that the receipts amounted to £777; and the expenditure to £467. The Board recommended a dividend at the rate of 1½ per cent. per annum, which would absorb £187. The report was adopted.

The balance-sheet of the Newmarket Water Company for the past twelve months shows an increase of profit over the previous year; and an amount available for division of £1106. Out of this, on the recommendation of the Directors, a 5 per cent. dividend has been declared.

A satisfactory statement was made by the Chairman of the South Staffordshire Water Company (Mr. F. James) to the shareholders at their half-yearly meeting last Thursday week. He said that, acting on the special resolution passed at the last meeting of the proprietors, the entire stock authorized by the Company's Act of Parliament (£60,750) had now been created, and £11,654 paid upon it. Of the total sum, £58,709 had been allotted; and the balance of £2041 was in the hands of the Directors for allotment when and how they thought fit. They had £49,096 of ordinary stock, and £20,250 of debenture stock yet to be called up whenever the interests of the Company required it. The capital outlay of the past half year had been exceedingly small—£3081. The number of houses to which services had been laid on during the six months was 1435; and the total now supplied was nearly 70,000, which, taking the usual computation of five persons to a house, meant that the Company were now supplying pure water to 350,000 people, in addition to an enormous number of trading concerns in the district. The sum received from water-rates was considerably in excess of the corresponding half year—£37,285, against £34,605. Including the balance of £1523 brought forward, the total revenue was £39,089. The expenditure amounted to £12,906, as against £13,195 in the corresponding half year; but the last-named sum included a payment of £1000 of the law expenses in connection with the Company's application to Parliament, which had now all been paid off. The Directors had now been able to carry out a desire they had long held, by establishing a depreciation fund, to which they had carried £2000. The balance, after deducting this sum, was £15,542, against £13,349 at the corresponding period of last year. From this it was proposed to pay a dividend of 5½ per cent. The report was adopted; and the dividend recommended declared.

Speaking at the annual meeting of the Stroud Water Company, the Chairman (Rear-Admiral John Bythesea) stated that the works had been sufficiently completed to enable a portion of them (if the inventory which was now being made proved satisfactory) to be taken over by the Company. Sufficient capital had not yet been received to permit of the entire distributing system being laid; but the part of the property which they proposed to take possession of was the best paying portion, and as further money came in, the pipes would probably be laid upon the arrangement provided by their Act, which was, that the people who required water conveyed to them should ensure the Company 10 per cent. on the outlay for three years. With regard to the softening works (capable of dealing with 750,000 gallons of water daily), these were in full operation, and working almost automatically, in a satisfactory manner. He believed that the mills would find the softened water an economical advantage; and if they took it in the ratio of the Yorkshire district, then the Company would have a satisfactory return. The Board, he further mentioned, were very anxious to pay off the Lloyd's bonds, which at present stood at £16,225. The report of the Directors was unanimously adopted.

THE SALFORD GAS SCANDAL.

The Proposed Commission of Inquiry—The Consultative Committee's Report.

At the Meeting of the Salford Town Council last Wednesday—the MAYOR (Mr. B. Robinson) presiding—the following resolution stood on the *agenda* in the name of Mr. Phillips: "That the Mayor be authorized to affix the common seal of the Corporation to a petition to Parliament, to be prepared by the Town Clerk, asking that a Commission may be issued to inquire into the frauds in connection with the gas-works."

On the motion being reached, the TOWN CLERK said that Alderman Dickins proposed to move, and Alderman Walmsley would second, an amendment to the effect that the following words should be added: "But is of opinion that no steps should be taken in the matter until after the action of *The Salford Corporation v. Lever* is decided, and hereby instructs the Mayor to present the petition to the Council before the seal is attached." Replying to a question as to when the hearing of the case was likely to come on at Leeds, he said the Commission for the Assizes was to be opened on the 14th inst. As two of the law officers of the Crown were to be engaged, a special day would probably be fixed for the trial. It would most likely take place within the seven days following the 14th.

Mr. MANDLEY said he should like to know, supposing the trial only resulted in a lot of legal jargon, and was postponed till the Summer Assizes, whether the petition for a Commission would be likewise postponed.

The TOWN CLERK said that in such an event the matter might be reconsidered by the Council. Any gentleman could give notice of motion on the subject.

Mr. PHILLIPS inquired whether Alderman Dickins would consent to put the rider to his resolution in these words: "But that no steps be taken until the action is tried at Leeds."

Mr. SNAPE considered it unnecessary for the Council to guard themselves in the way proposed by Mr. Phillips. It would be within their province at the Council meeting in April, when they knew what had happened at Leeds, to come to such a decision as they then thought proper.

Alderman DICKINS observed that the object of the amendment was simply to secure that no steps should be taken to forward the petition from the Council until the whole of the facts of the case were before the public—that was at the end of the trial of the action against Mr. Ellis Lever. If the trial was simply postponed without any of the facts being brought out, he should be disinclined to go forward with the petition till they were brought out.

Mr. MIDDLEHURST inquired why Sir Charles Russell had thrown up his brief for the Corporation.

The TOWN CLERK replied that Sir Charles Russell had not refused to act for the Corporation, and had not thrown up his brief. He accepted a retainer, but he (the Town Clerk) had a conversation with him; and he brought such facts to his knowledge that he thought it was only a prudent course to allow Sir Charles to give up his retainer. Replying afterwards to an inquiry as to whether the cost of the proposed Commission would fall on the borough, he said he was afraid it would.

Mr. PHILLIPS then submitted the motion as given above. He said he thought that, however much the members of the Council individually might agree or disagree with the proposal contained in the resolution, there was one point on which he believed they would all be agreed, and that was that, in the interests of the borough of Salford, it was desirable to get this matter settled once for all. The work of the Investigation Committee, the appointment of which it fell to his lot to move, was an honest attempt to ascertain what state of things existed, and an honest attempt to improve that state of things; and he was prepared to say that the Investigation Committee did its work well, and deserved the good opinion of everybody who had the welfare of the borough at heart. It was followed by the Consultative Committee, to whom fell a task of exceeding difficulty, and a task not without danger to those who composed the Committee so far as their reputation in the borough was concerned. They might have gone into courses which would have landed the borough in large bills of costs without any result; or they might, on the other hand, have taken steps which everybody would have disagreed with. He never went to a meeting of that Committee without feeling a great responsibility. He thought that this feeling ought to have been more widespread—that the difficulty of the work the Committee had to do ought to have been more fully recognized. The policy of the Committee, as the resolutions passed had shown more than once, had been the policy of the Council. Nevertheless, the present position was very unsatisfactory to the members of the Committee as well as to the Council. So far as he was concerned, he could certainly say that the recent development the turn of affairs had taken had been to a large extent unforeseen. Certainly it was not expected by them, or they would not have got into the position they were in. The point they had now to deal with was as to what means could be taken to satisfy the public mind; and he thought the best way to do so would be to appoint a Commission armed with full powers to probe the matter to the bottom, and bring this unsatisfactory business to an end as early as possible. Respecting the amendment proposed by Alderman Dickins, he agreed with it so far as it desired that nothing should be done in regard to a Commission that would interfere with the course of the trial at the forthcoming assizes at Leeds.

Mr. HEWITT seconded the motion.

After further discussion, Mr. Phillips, with the consent of his seconder, agreed to the addition to the motion of the following words: "That the petition be submitted to the Council before the seal is attached, and that the presentation of such petition be deferred until after the trial of the action of *The Salford Corporation v. Lever*, set down for trial at the ensuing Leeds Assizes."

Mr. MANDLEY, in supporting the motion, said it must be remembered that the Corporation were fighting not only Mr. Lever but a vast organization of contractors all over the country, with great wealth at their disposal. Every legal quibble, every technicality that could be adduced, would be employed at the forthcoming assizes to prevent the trial being a trial on the merits.

The TOWN CLERK: That course has been pursued already.

Mr. MANDLEY said that under these circumstances he was led to believe this matter would be put off till the Summer Assizes; and then something fresh might be produced which would postpone it till the Autumn Assizes, and so on.

Mr. RYCROFT remarked that, although he did not agree with those who thought the presentation of the petition should be delayed, he was going to support the motion. He was thankful to find the Council showing a disposition to adopt the principle that an inquiry should take place.

The motion, with the addition of Alderman Dickins's rider, was unanimously adopted.

The Consultative Committee then submitted the following report:—

Your Committee report that subsequently to the report presented to the Council on the 4th of September, 1889, the actions which were then pending against certain contractors have been discontinued. Some time after the above-mentioned date, information was obtained that Mr. Ellis Lever and the late Mr. William Healey had been guilty of paying bribes or commissions to the late Gas Engineer; and the Town Clerk therefore, in accordance with his general instructions, commenced actions against Mr. Lever and the Executors of Mr. Healey for the recovery of the amounts respectively so paid. Neither your Committee nor the Town Clerk was aware, at the time of the agreement referred to in the last report, that such persons had been implicated in these frauds; and it is quite clear that the claim of the Corporation for a repayment of the same was not included in the discharge to be given to the late Gas Engineer in pursuance of the agreement. Mr. Ellis Lever applied to the Court for the removal of the trial to London, on the ground of local prejudice in Lancashire; but as this would have delayed the trial for a long time, Counsel for the plaintiffs opposed the removal, and suggested Leeds as the place of trial, which was adopted by the Court, and the trial accordingly set down for the 14th inst. Both the actions against Lever and the Executors of Mr. Healey being now pending, the Committee do not consider it desirable to speak more fully about them; and for the same reason your Committee have not considered it necessary to call upon Mr. Hunter for the transfer of the money payable to the Corporation under the agreement. When these actions have been concluded, your Committee will take steps for receiving the money payable to the Corporation, and will be prepared to report more fully on the matters committed to them.

The TOWN CLERK, in answer to Mr. Rycroft, said that, as stated in the report, certain actions had been discontinued; but that was no barrier to further proceedings if it should be decided that other actions should be commenced.

The MAYOR said he would undertake that no release should be given to any contractor until the matter had been brought before the Council.

On the proposition of the MAYOR, seconded by the EX-MAYOR (Alderman Dickins), it was agreed that the report should be received and entered on the proceedings of the Council.

BIRMINGHAM CORPORATION GAS AND WATER SUPPLY.

Committees' Annual Reports.

At the Meeting of the Birmingham City Council last Tuesday—the MAYOR (Mr. Clayton) presiding—the annual reports of the Gas and Water Committees were submitted for approval.

Alderman POLLACK presented the report of the Gas Committee (the salient features of which were given in the JOURNAL for the 18th ult.), and moved to authorize the appropriation, out of the profits of the Gas Department for 1889, of the sum of £25,000 to the credit of the improvement rate of that year, the addition of £13,688 to the reserve fund, of £15,000 to the sinking fund, and of the balance of £16,648 to the credit of the improvement rate. He said that the various sums embodied in the resolution represented the surplus profits of the department during the past year—viz., £70,336; being the largest profit made since the Corporation acquired the gas undertaking. It had been made notwithstanding that, during the past six months, there had been an increase in the price of coal amounting to £18,000 on the amount used, and notwithstanding that the wages at the works during the past ten weeks, owing to the adoption of eight-hour shifts, had been £4000 in excess of those of the corresponding period of last year. The department had derived considerable profit from the increased value of residuals, and especially of coke, which had produced the largest amount since 1876, when it realized £70,790, as against £60,384. They were now reaping the advantages of the regenerative system of furnaces, the value of which was not so apparent when the cost of fuel required for heating retorts was lower. He could not say whether they would be able to realize anything like the same profit during the next financial year. In 1887 they only obtained £34,835 for coke. Tar and ammoniacal liquor showed an improvement also; but produced much less than in 1881 and 1882. In the latter year the amount spent for coal was balanced by the revenue from residuals; but last year the coal bill had been £60,000 in excess of that return. During the first three quarters of the year the sales of gas had increased by 3 per cent.; and during the last quarter by 6 per cent. The increased profits of 1889 were above £15,021; and they were accounted for as follows:—Additional revenue from gas, £13,854; from residuals, £26,612; from rents and discounts, £516—being a total of £40,982. On the other side, the higher price paid for coal was to be reckoned as £20,198; and the additional expenditure for wages was £5828—being a total of £26,026. The statistics at the end of the Committee's report showed that the expenditure for a plant the output of which last year was 3619 million cubic feet, and which was capable of producing 15 per cent. more gas if a small additional outlay was made upon it, had been £2,211,000. This compared well with the original price paid for the works, which was £2,001,000 for an output of 2328 million cubic feet; for whilst the production had augmented by 55 per cent., the capital expenditure had only increased by 11 per cent., and in that capital expenditure there had been included the purchase of 50 acres of surplus land, which might be available at a future period for an extension of the works, for a water-gas plant, or for an electric-light plant. When the resolutions which he proposed were sanctioned, the contributions of the Gas Department to the rates would have been

£372,613; the reserve fund would stand at £100,000; and the sinking fund amount to £399,494—being a total of £872,107. Yet while the gas sold last year had been 55 per cent. in excess of that sold in 1876, the amount received had been only 17 per cent. more; and if the consumers had now to pay at the same rate as in 1875 (the last year under the Companies), they would give £160,000 a year more. He hoped these results spoke well for Corporation management. The sum to be added to the reserve fund would bring it up to the authorized amount (£100,000); so that in future its interest—£4000 a year—would augment the annual payment of £25,000 to the rates. That was not the only contribution. They made an indirect allowance, by means of the gas used for public purposes, of about £8000 a year—a contribution which would be increased by at least three-fifths when the courts came to be lighted. There were many reasons which made it desirable to so reduce the capital account as to extinguish within a reasonable period the heavy goodwill. Moreover, part of the capital account was based upon a valuation of the perpetual annuities at 25 years' purchase, and the market value was very much higher. In his opinion, if the Council were to carry out their Acts of Parliament, the sinking fund contributions ought to be increased. The special sum of £16,648 named in the resolution was set aside in consequence of a change in the close of the financial year from December to March. It would ease the requirements of the Finance Committee. The Gas Committee hoped to escape the necessity of increasing the price of gas; but it was impossible to foresee what would be the cost of coal at midsummer, when the present contracts ran out.

Mr. W. F. Green seconded the motion.

Mr. Stringer proposed as an amendment—"That the recommendation of the Committee as to the profits of the Gas Department for 1889 be referred back to them for the purpose of considering whether, having regard to the large increase in those profits which has taken place, the price of gas could be reduced to the amount charged in 1884, 1885, and 1886." When, he said, the price of gas was increased by 2d. per 1000 cubic feet, it was understood that the advance would only be temporary.

Mr. Jacobs seconded the amendment.

The first part of the amendment was ruled out of order, inasmuch as the Council is governed by statute so far as the disposal of profits is concerned; and Mr. Stringer consented to move for a reduction of prices on the proposal to adopt the report.

The motion was then agreed to.

It was next resolved to increase the salary of Mr. Morrison, the Works Superintendent at Saltley, by £50 per annum.

Alderman Pollack, in moving that the Gas Committee's report be approved, spoke of the experiments at the Swan Village works with a system for the continuous charging of retorts, which, he said, had been successfully tried at Ludlow. The coke that was drawn was of exceedingly good quality, and almost every vestige of smoke disappeared. The supply of Harborne, he also remarked, had been transferred from the Swan Village works to the works at Saltley and Windsor Street. Last year the Swan Village works had to produce 40 million cubic feet of gas extra; and the Committee found that if the demand on the works continued to increase, they would have to use retort-houses which could not be employed economically. Another reason for the change was that it would give Harborne a better pressure. The Committee had arranged to put the structural gas-fittings in the artizans' dwellings the Improvement Committee were erecting, and hoped to supply the tenants with gas, either by means of the newly-invented prepayment attachment, or by ordinary meters. The Committee were very anxious to supply tenants of that class of houses with gas. They had arranged to distribute the cost of the gas services for courts over five years. This would come to about 2s. 6d. per quarter; making the total cost of a lamp 8s. 6d. per quarter. He should think that, when landlords became fully aware of the facilities offered to them, they would come forward and light the courts without being forced.

Mr. Bloor, in seconding the motion, inquired how it was that while in 1876, with 299,396 tons of coal carbonized, the coke sold produced £70,790, while in 1889, when 90,000 more tons of coal were carbonized, the sales of coke realized £10,000 less.

Mr. Stringer then moved the second part of the amendment given above.

Mr. Jacobs, in seconding the amendment, remarked that he thought the Committee could reduce the price of gas and yet continue to make large contributions to the improvement rate.

Mr. Bowkett observed that the Committee should reconsider the question of making the price of gas uniform. He thought the charge to all consumers should be 2s. 3d., and believed the increased consumption would recoup the Committee for the reduction.

Mr. Granger said with regard to the price of gas, he did not see how, with the probable rise in coal, the increased cost of labour, and the fluctuations in residuals, the Committee could safely make a reduction at present. As to experiments, he believed that the bad quality of the gas was due to so many experiments being tried at their works. He hoped that the Committee would at the first opportunity consider whether they could not reduce the maximum charge for gas.

Alderman Avery called attention to the fact that, since the Committee acquired the gas-works, they had voted £370,000 in relief of the rates, while the consumers had benefited by reductions in price to the extent of £140,000.

After some further comments,

Alderman Pollack, in replying on the discussion, explained that the relatively higher sum realized from the sale of coke in proportion to the amount of coal carbonized in 1876 as compared with last year, was due to the fact that in the former period the price of coke was nearly 50 per cent. higher than it was now. With regard to the small consumers, he wished to say that the Committee were most anxious to have the opportunity of reducing the price charged to them; and whenever the right time came, they would reconsider the possibility of reducing the scales to two. It must be remembered that in Birmingham there was no charge for meter-rents. Although but one rate per 1000 cubic feet might be made, the imposition of a meter-rent practically divided it into two. In Leeds, for instance, an investigation which was recently made showed that the small consumers paid 6¾d. per 1000 cubic feet for meter-rent, whereas the meter-rents of the larger consumers only came to 1¾d. per 1000 cubic feet. He thought this would answer most of what had been said with reference to the differential charges; but, nevertheless, when the Gas Committee were in a position to reduce the price, as they hoped soon to be, all these matters would be considered, as they had no desire to favour one class more than another.

The amendment was lost; and the motion was carried.

The report and accounts of the Water Committee were next submitted. The latter showed that the profit for the year amounted to £2878. This sum being deducted from the aggregate deficiency of £20,023, reduced it to the sum of £17,144 to be cleared off from the anticipated profits of future years. The sum of £2000 interest on the reserve fund of £50,000 had been paid to the City Treasurer. The Committee also submitted statistical tables, showing the progress of the department since it had been under Corporation management. The total capital expenditure in extensions of works from January, 1876, up to the present time, had amounted to £498,922. The length of new mains laid during the same period had been 218¾ miles, at a cost of £202,110. The quantity of water supplied last year was 5211 million gallons, a daily average of 14·28 millions, as compared with 4158 millions, or a daily average of 11·42 millions in 1881, and 3031 million gallons, or a daily average of 8·30 millions, in 1876. Last year water-rentals and charges for fittings amounted to £130,661; and the working expenses, including interest on mortgages and sinking fund charges, were £73,943—leaving a profit, including water annuities, of £56,718. In 1881 the rentals were £121,387, the working expenses £60,123, and the profit £61,265. In 1876 the rentals were £93,527, the expenses £38,138, and the profit £55,389. The total number of new houses supplied with water since the transfer of the undertaking to the Corporation was 69,789 of which 35,717 were supplied at or under 10s. per annum. The report of the Committee stated that they proposed to adopt a site at Longbridge, for a new source of supply. The purchase of the land and necessary works would cost £25,185. In regard to hydraulic lifts, the Engineer (Mr. J. W. Gray) had prepared an elaborate report, and he recommended that £15,000 be expended in a hydraulic power station and for further mains for power purposes, and for increasing the power and making more available the various fire hydrants where power mains were laid. The Committee proposed to apply to the Local Government Board for their sanction to borrowing £50,000, to cover the cost of the hydraulic power scheme, and to provide for the other capital expenditure which would become necessary. Since the Council meeting in February, 1889, they stated that mortgages had been paid off to the extent of £17,072, and loans received amounting to £22,629; bearing interest as respects £22,600 as follows—viz., £10,000 at 3 per cent., and £12,600 at 2¾ per cent. The mortgage debt had thus been increased to the extent of £5556. The sum of £14,443 Birmingham Corporation 3 per cent. stock had also been allocated to the Water Department, constituting with the above-mentioned sum of £5556, an amount of £20,000, applicable as follows:—capital expenditure on extensions, £15,324; recouping Treasurer for overdraft on capital account to Dec. 31, 1888, £4675—£20,000.

Alderman Martineau, in submitting the Committee's report, moved that authority be given for the purchase of a freehold site at Longbridge for the purpose of an additional deep well, and for the provision of pumping plant, mains, &c., at an estimated cost of £25,185. He reminded the Council of a report made by the Engineer, two years ago with respect to the position and probable requirements of the department in the ensuing five years. It appeared that in the year 1882 the daily average supply of water was 10·88 million gallons; but that in 1886 it had risen to 12·95 million gallons, so that in the fifth year they had arrived at an increase of two million gallons a day. If Mr. Gray had waited for another year—viz., 1887—it would have shown a far larger figure; the consumption running up to over 14 million gallons per day. Looking forward, Mr. Gray two years ago estimated that by Christmas 1892 the supply would amount to about 16 million gallons a day on the average, or about 20 million gallons a day as the maximum during an average period of drought. In other words the same for the average as they had this year with difficulty contended with as the maximum. It was clear that they were approaching unpleasantly near to the limit of their power of supply in comparison with the increasing demand. They had added no new source of supply since 1888; but during a hot week in the middle of last year, they were able to get up to 17¼ million gallons, showing a substantial reserve of power beyond the 16 million gallons mentioned in their Engineer's report. By a re-arrangement of mains and engines at Ashton, they could get an additional 2 million gallons per day, which would make a total of 19 to 20 million gallons, which Mr. Gray looked forward to as the maximum requirement in the year 1892. While, however, they had this margin, it was none too soon to make provision for further sources of supply; and the direction in which these were to be looked for was in additional wells. They had been taking an increased quantity from the rivers; and if they were to keep up the quality of the water, it must be by an admixture of more water from the wells. The Committee had given careful consideration to various sites, and the one recommended was satisfactory in every respect except one, and that was that owing to its distance, they would have to lay down four miles of mains to connect it with their works at Selly.

Mr. Fallows seconded the resolution, which was carried.

Sir Thomas Martineau then proposed that about 600 square yards of land be acquired from the Improvement Committee at a rental of 3s. per square yard, for the purpose of establishing thereon a hydraulic-power station; and that the Committee be authorized to proceed with the erection of the station and engines and to lay down the necessary main, at an estimated cost of £12,500. He pointed out that the Committee in 1885 supplied 30 lifts; and they obtained a rental from them of £510 a year. At the present time they were supplying 61 lifts, and receiving a rental of £1000 a year.

Alderman Barrow seconded the resolution, on the ground that the undertaking would be a beneficial and profitable one.

The resolution was carried.

Sir Thomas Martineau, in moving the adoption of the Committee's report, said he wished to remind the Council that they were approaching the end of the capital available by borrowing for the extension of

works; and it would be necessary some time or other—and, he was afraid, before very long—to obtain further borrowing powers. The increase in the water-rents amounted to £4195; and this had enabled them to show a profit on the whole undertaking of £2878. This was the first substantial profit they had made since they lowered the water-rents in 1883. They had in the past expended beyond their receipts sums which exceeded £20,000; so that they would have to apply yearly the profit which they made to the reduction of this debt.

After a brief discussion, the motion was adopted.

BATLEY CORPORATION GAS SUPPLY.

The Engineer and Manager of the Batley Corporation Gas-Works (Mr. J. F. Bromley) has just presented to the Gas Committee a very satisfactory account of his first year's management of the undertaking—viz., the twelve months ending Dec. 31 last. In that period the quantity of coal carbonized was 13,659 tons. From this he produced 135,981,900 cubic feet of gas of an average illuminating power of 18 candles, of which 124,855,600 feet were sold, 801,000 feet used on the works, and the remainder (about 7¼ per cent. of the total make) unaccounted for. The receipts for gas supplied for public and private lighting amounted to £18,244; meter and stove rentals produced £553; and residuals, £4515—the total receipts for the year being £23,375. The manufacture of gas cost £7989 (coal figuring for £4810). Its distribution came to £431; rates and taxes and management, to £1929—the total expenditure being £10,482. The balance carried to the profit and loss account was £12,893. Of this a sum of £6326 was absorbed for interest and the sinking fund; £2000 was taken to relieve the rates; and £1600 for the depreciation account—leaving £2967. This, added to the balance accrued to the end of the previous year (£11,011), made up a total of £13,978. The amount expended on capital account at the close of 1888 was £162,305. This was increased last year by £562 for mains, services, meters, &c.; making £162,867 as at Dec. 31 last. This is £2858 in excess of the loan capital of the undertaking. The balance-sheet shows that the liabilities at the close of the past year amounted to £179,398. The assets consist of the amount expended on the works (£162,867); sundry debts, £11,336; value of the stocks on hand, £1878; and the amount in the hands of the Treasurer, being the balances on the revenue, sinking fund, and contingency accounts—together, £6061, less the overdraft on capital account (£2744), £3317—total, £179,398.

At a meeting of the Gas Committee on Monday last week, they raised Mr. Bromley's salary by £50 per annum, in consideration of the excellent results shown by the accounts he submitted.

THE CANTERBURY CORPORATION AND THE GAS AND WATER COMPANY.

The Proposed Purchase of the Works—The Petition against the Company's Bill.

The draft provisional agreement for the purchase of the Canterbury Gas and Water Works, as submitted by the Company, came before the members of the Town Council at their meeting last Wednesday. Mr. Cross stated that the agreement had been carefully gone through by the Committee. They were of opinion that the Company had taken very good care of their own interests; many of the clauses being such that they could not recommend the Council to adopt. He thought it unnecessary to go into details; and so would at once move this resolution—"That the Council, having considered the draft agreement submitted by the Canterbury Gas and Water Company, feel it is useless to enter into the objections which they entertain to various clauses, inasmuch as it appears that it would not be possible to carry in the Council by the requisite statutory majority a resolution in favour of the purchase of the Company's undertakings by arbitration; and the Council therefore regret that any further negotiations for sale or purchase must fall through, unless the Company be willing to open further negotiations on the basis of offering their undertakings to the Council at a price." Mr. Warren seconded the resolution, which was carried. Mr. Cross said he would like to ask whether it would be desirable that any Special Committee should be formed to confer with the Company in reference to the petition against the Bill. The Directors might be willing to drop the clauses to which they objected; and expense might be saved. Alderman Hart said he thought (without committing the Directors to anything he might say) there was a disposition to meet the Council in any objections they might have to the Bill. They wanted to go on in harmony; and if they could come together on proper terms, they would be glad to do so. They were sorry the Council could not see their way to continue the negotiations. It was understood that the Council would go into Committee at the close of the meeting, and deal further with the matter on the lines suggested by Mr. Cross.

From a perusal of the petition which the Corporation have presented against the Company's Bill, it would appear that, if the whole of the clauses were dropped to which they take exception, the Bill would be reduced to a mere skeleton. They submit that there is no public or local demand for an extension of the Company's gas limits; and that there is no necessity for the Company to acquire additional land, and to erect new works thereon. They object to the Company being authorized to apply capital for the purposes of obtaining powers to supply and of supplying electricity. Such an undertaking, they say, must necessarily be of a speculative nature, and may result in loss to the Company, which they will be compelled to recoup out of their gas and water undertakings, and for the purpose of so doing it will be necessary for them to keep up or increase the price of gas and water. They do not see any necessity for the proposed large increase in the capital of the Company, which, they urge, would be most injurious to the interests of the consumers. Objection is also made to the proposal of the Bill that the new capital to be raised as ordinary capital should receive a dividend at the rate of 8 per cent.; and it is submitted that such dividend should in respect of any additional capital which may be authorized, be reduced in accordance with the practice of Parliament to some lower rate of dividend. The provisions of the Bill relating to the separation of the gas and water accounts, and allowing the Company to apportion in such manner as they think fit between these accounts the expenses common to both, the Corporation consider insufficient for the proper protection of the gas and water consumers respectively; and they do not think it desirable that the Company should be allowed to carry out their proposal to substitute the sliding scale of price and dividends for the present fixed maximum price and dividends. There are "several other provisions" in the Bill regulating the supply of gas which the Corporation regard as prejudicial to the consumers and should not be sanctioned; and they submit that no further powers should be conferred on the Company, as the same are unnecessary. The petition concludes: "If, nevertheless, your honourable House should be of opinion that some further powers are required, provisions should be inserted in the Bill for empowering your petitioners to purchase the Company's undertakings on fair and reasonable terms, for their protection and for the protection and benefit of the consumers of the city generally."

THE JOHANNESBURG GAS UNDERTAKING.

In a recent number of the *Diggers' News*, a Johannesburg paper, an account was given of the progress of the gas undertaking which has been established for the supply of the town under the Government concession. The particulars given were mainly obtained in the course of an interview which a representative of that paper had with Mr. W. Carr, who, it may be remembered, is superintending the erection of the works under Mr. Thomas Newbigging, of Manchester, the Consulting Engineer of the Johannesburg Gas Company, Limited. The ground which has been granted by the Government for the works is 8¼ acres in extent, and is situated in the lower part of the town. At the time the article was written (towards the end of January), the retort-house was up, but not roofed in. This building is divided into three sections; the largest one being in the centre. The side compartments are the coal-stores, which will be capable of containing 1400 tons. The whole block covers an area of 125 feet by 100 feet. When finished this house will be furnished with four benches of retorts, or 48 mouthpieces, and be equal to a production of 250,000 cubic feet of gas per diem; but there is space in the house for doubling this quantity. Another building on the site consists of the exhauster, meter, and governor houses; the wings containing the boiler-house, blacksmith's and carpenter's shops, and stores. The Manager's house is up; and the offices and laboratories will soon be erected. The Company will eventually have two gasholder tanks on their ground—one 60 feet, the other 100 feet in diameter. The former is already in the country, and portions of it even on the spot. The ground has been dug out for it to a depth of 10 feet in the north-western corner of the property, and a start made to put the tank in. The ground here is in the lowest part of the area; and it will subsequently be levelled up with earth taken from other parts, and with refuse from the works. The other holder is on its way from England, and will be erected next to the 60-feet one. It is not necessary, however, to have it put up in order to make a start in supplying gas to the town. This will be done as soon as the necessary plant has arrived—including roofing girders, scrubbers, lamp-posts, and pipes (10 or 12 miles of which are already lying on the spot). These are practically all in the country now, and on their way up to Johannesburg. The rest of the plant—the condensers, washer, scrubbers, purifiers, and tar and liquor tanks—will be situated just below. There are upwards of 40 miles of mains to be laid in the town; but this work will not be begun until the works are ready for supplying gas. It is expected that the place will be lighted by July next. It is not yet decided at what price gas will be sold; but in any case it will be cheaper than petroleum. The Government will pay for lighting the streets, including the cost of the lamp-posts—the Sanitary Board probably taking over this department. The Company own a coal mine in the Middleburg district, containing good gas coal in sufficient quantity for their purpose. It was tested by Mr. Newbigging, who found it to yield 11,000 cubic feet of about 19-candle gas per ton. An existing tramway will probably be extended to Middleburg, and run very near the colliery, and thus materially reduce the cost of transport. The Company's capital is £200,000, in £1 shares, of which 70,000 are reserved; the working capital being £70,000. The Company's London Agents are Messrs. Davis and Soper, of Bury Street, St. Mary Axe, E.C.

York and the Bradford Water Scheme.—The petition of the York Corporation against the Bradford Water Bill has been deposited in the House of Lords. After stating the particulars of the Bradford scheme, the petitioners proceed to allege that the city and the water supply thereto will be injuriously affected by the provisions of the Bill, and they accordingly object to it. They say that the water supply of York is at present drawn from the River Ouse, at a point above the city, by means of works belonging to the York New Water Company. The River Nidd forms one of the principal tributaries to the Ouse, and enters that river a few miles above York; and the waters of the Nidd are the purest and most potable of the tributaries of the Ouse. The powers of the Bill would enable the Bradford Corporation to appropriate upwards of 43 square miles of drainage area of the Upper Nidd Valley; and from this area it is proposed to abstract the most suitable waters. An enormous quantity of water, far in excess of the requirements of Bradford, or of any reasonable estimate of the prospective increase thereof, will thus be daily drawn from the River Nidd for distribution in the Bradford district; and this supply will pass into another watershed, and ultimately find its way into the River Aire, which joins the Ouse many miles below York. Moreover, the petitioners are apprehensive that if the scheme be once sanctioned, the drainage area of the Nidd, or of other tributaries of the Ouse above York, will be further appropriated as the demands for the Bradford district, or districts immediately adjoining thereto, increase; and that the abstraction of further supplies of pure water from the high lands of its drainage area will render the Ouse an unfit source of supply for the city. In that case the City Council or the Water Company would be compelled to seek elsewhere a new supply; but inasmuch as the best of their natural sources of supply would have been appropriated, they would be driven to a greater distance or be obliged to accept an inferior quality of water.

THE EXTENSIONS AT THE LEIGH GAS-WORKS.

In the JOURNAL last week we briefly noticed the completion of the extensions at the gas-works of the Leigh Local Board, which have been carried out from the drawings and specifications, and under the supervision of the Engineer and Manager (Mr. A. T. Fletcher), at a cost of £8300. The extensions were commenced in March last year, and included, besides the tank and gasholder mentioned last week, the enlargement of the coal-store, the erection of a new scrubber, and the fixing of plant for the manufacture of sulphate of ammonia. Four generator furnaces, heating 56 retorts, have been erected from designs by Mr. Fletcher; and it is expected that a great saving will be effected in the carbonization of coal. The necessity for the additional furnaces was shown by the fact that during the past year every retort was kept in operation. On the 1st of March, 1889, Mr. J. Cowburn commenced the excavations for the tank; his contract being completed within the specified time. Messrs. R. Dempster and Sons, of Elland, were the contractors for the holder, which is a telescopic one in two lifts. The holder is 100 feet in diameter; each lift being 28 feet deep. Its capacity is 420,000 cubic feet, which brings the total storeage up to 720,000 cubic feet. This, it is expected, will suffice for some years. The largest delivery of gas in 24 hours last year was 400,000 cubic feet; and there being storeage for only 300,000 cubic feet, much difficulty was experienced in keeping up the supply. As already stated, the completion of the extensions was celebrated on the 26th ult., when the Chairman of the Board (Mr. Alderman Thorp) performed the ceremony of turning the gas into the holder, in the presence of a numerous company, which included Mr. J. Timmins, Engineer of the Wigan Corporation Gas-Works, who was formerly at Leigh. After the ceremony, Alderman Thorp gave a few particulars in regard to the undertaking. He stated that the amount of capital employed therein on March 25 last year was £72,831. In 1875 the quantity of gas sold was 23 million cubic feet. The consumption had gradually increased; and this year it would probably reach 58 millions. The percentage of unaccounted-for gas in 1875 was 12·075; but now it was extremely small—3·44 per cent. The capital expended in 1875 was £48,747; but it now stood at £80,420. The Board had reduced the price of gas from 5s. 6d. per 1000 feet in 1874 to a net average of 2s. 11d. now. He called special attention to the rapid increase which had taken place in the number of consumers. In 1875 they were 1184; in 1884 they had risen to 1427; in 1887 they were 1559; and now they were 2400—being an increase of 900 in three years. In the future they would have to deal with the electric light; but until it could be produced at a cheaper rate than the present, it would not be a formidable competitor with ordinary people. He asked those present to drink the health of the contractors and of their old friend Mr. Timmins, whom they were glad to see amongst them, and their Engineer and Manager (Mr. Fletcher). The toast having been duly honoured, Mr. Cowburn replied; Mr. Timmins expressed his pleasure at being present; and Mr. Fletcher thanked the Chairman and members of the Board for their kindness and assistance since his appointment under them, and said he was glad the extensions—the first which had been entrusted to him—had been successfully completed.

THE PUBLIC LIGHTING OF WIMBLEDON.

Our readers do not require to be reminded that Wimbledon is one of the places usually cited by members of local authorities when they are advocating the adoption of oil lighting with the view of coercing a gas company into reducing their terms. Nor do they need to be told how the lighting in the important district above named has been carried out; this having been done on more than one occasion in our "Correspondence" columns—perhaps in language that was regarded as all too plain by the partizans of this system of illumination—by Mr. R. P. Keys, a resident in the locality. It was only to be supposed that the Local Authority would be reluctant to admit that the oil lighting was a lamentable failure; but in this as in many other cases the homely saying that "actions speak louder than words" is specially applicable. At the meeting of the Wimbledon Local Board last Wednesday, it was decided to adopt a general scheme of electric lighting, for which it is proposed to raise £30,000, though not more than £14,000 will be required for present purposes. This matter has been before the Board more or less for close upon two years and a half, yet when the members were called upon to vote upon the question, two were absent and others complained that it was being "rushed." The adoption or rejection of this scheme is characterized by a writer in a local paper as one of the most momentous issues the Board has ever had to consider. Doubtless; seeing that upon it depended the retention or the banishment into obscurity of what the writer describes as "the wretched farthing-rushlight kind of flickers which are dignified by the name of lamps." It is admitted that the decision has not been come to any too early, as "if something had not been done to remedy the lighting defects in Wimbledon, they would soon have become a public scandal." Whether the highest wisdom has been shown in the selection of the illuminant which is to take the place of the existing one remains to be seen; but a hope appears to be entertained that, if the installation is properly carried out, the new venture will help to considerably reduce the rates. How far the residents generally will assist to the realization of this hope it is impossible to say.

The Water Supply of South-West Durham.—Last Wednesday, the Teesdale Sanitary Board had under discussion the water supply to the colliery district of south-west Durham. A deputation attended from a ratepayers' meeting, and explained that the wish of the inhabitants was that an independent water supply should be available to the district, and that the source of the supply be Cold Wells, which neighbourhood an engineer had at one time surveyed in the interest of the Teesdale Sanitary Authority. It was then estimated that the cost would amount to £4000, with sufficient storeage for 30,000 gallons of water. It was resolved that the works should be rapidly pushed on with, as there was a prospect of the population being materially increased, owing to the development of new collieries.

CITY OF ST. PETERSBURG NEW WATER-WORKS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. T. WESTERN in the chair.

The Directors' report stated that the gross receipts for water had amounted to 228,863 roubles (about £30,927), against 217,652 roubles for 1888; being an increase at the rate of about 5¼ per cent. The miscellaneous profits were 2517 roubles (about £340). The working expenses amounted to 104,269 roubles, against 93,797 roubles; and the balance of revenue was 127,110 roubles, equal nominally to £17,177. From this had to be deducted for difference in exchange £3832, and general charges of management (including discount charges and law expenses), £1345; leaving the net profit on the year's working £11,999—being an increase of £1106 over the preceding year. The interest on the "A" debentures would absorb £3600; leaving a balance of £8399, which the Directors proposed to appropriate as follows:—In the payment of 7 per cent. interest on the "B" debenture stock, £4174; to carry to the "B" debenture stockholders' dividend account (being the balance accrued thereon), £2062; and to the credit of profit and loss, £2163.

The CHAIRMAN said that since the shareholders last met, the Company had lost a faithful servant in the person of their Manager (Mr. A. Vernon), who had been connected with the Company since its commencement. Consequent upon his premature decease, and for other reasons, the Board thought it desirable to send to St. Petersburg, two of the Directors to look into affairs there. He (the Chairman) and Mr. Darley went out; and as the result of the visit, the Board decided to appoint Mr. Carr, who had been Engineer some nine or ten years, to the position of General Manager. It would be seen that there was an increase in the revenue of about 11,000 roubles, owing to the additional quantity of water pumped and distributed, while the working expenses had only advanced by about 2000 roubles. The returns that were sent over by the Engineer showed that during the past four years the quantity of water pumped had increased by from 25 to 30 per cent. To meet the increased demands, an additional engine and pumps, with the necessary buildings, were in course of erection at the old St. Petersburg station. There was only one small shadow upon the Company. They had unfortunately had a dispute with the town authorities upon the subject of meters. Their concession required them to supply water by measure; but it did not say who was to pay for the meters. For twelve years they had done what every other water company did under the circumstances. Where people required meters the Company had either asked them to buy them outright, or had found the meters and charged a fair rental for them. The question had been raised as to whether they had a right to do this under their concession; and a sort of test suit was entered upon (but not, he believed, in any hostile spirit) by the town authorities, for the purpose of getting the matter settled. In the Court of First Instance, in which the case was tried, a decision was rendered in favour of the Company; but the Municipality had appealed to the Palata, or Appeal Court, and it was expected that a decision would be given in a few days. This was a matter of some importance to the Company, as if the verdict went against them, it might entail a considerable capital outlay in providing meters. It would not make or mar their fortunes; but it was a point worth fighting for. He concluded by moving the adoption of the report.

Mr. R. S. GUINNESS seconded the motion.

The CHAIRMAN, replying to a shareholder, said the Municipality would have the right in about two years' time to say whether or not they would purchase the Company's property; but he did not think they would give the Directors' price for it.

On the motion of the CHAIRMAN, seconded by Lord E. S. CHURCHILL, Mr. Guinness was re-elected to his seat at the Board; and the Chairman, who also retired, was subsequently re-elected on the motion of Mr. GUINNESS, seconded by Lord CHURCHILL.

The Auditors having been re-appointed, a vote of thanks was passed to the Directors and the proceedings terminated.

Coventry Corporation Water-Works.—In connection with the extensions which the Coventry Corporation are making in their water-works, under the guidance of Messrs. T. and C. Hawksley, they have resolved to accept the tender of Messrs. G. F. Smith and Sons, of Milverton, amounting to £13,900, for the construction of two service reservoirs and other works at Barker's Butts.

A Fatal Escape of Gas.—Last Wednesday morning it was discovered that the infant son of Mr. Phillips, of Barbourne Terrace, Worcester, had been suffocated. There had been an escape of gas from a chandelier in the room in which the child and a nurse slept. Both were found unconscious. The nurse recovered; but restorative methods failed upon the child. At the Coroner's inquiry on the following day, a verdict of "Accidental Death" was returned.

The Northern Coal Trade.—The prospect of labour troubles has stimulated the demand for coal and coke in the Northumberland district; and should the strike take place in Yorkshire, both Durham and Northumberland will reap a share of the harvest. Already many inquiries both for gas and manufacturing coal have been received; and it is probable that, in any case, some orders will be booked. Steam coal is a little stronger, at 12s. 6d. to 13s. per ton free on board for best Northumbrian qualities; other kinds being at proportionate rates. Gas coal is steady, at from 13s. to 13s. 6d. per ton free on board in the Tyne; and the demand is better than usual at this time of the year—the exports being very large. Household coal is very dull. For bunker coal there is a good inquiry, and the price is a little firmer. Manufacturing fuel is very steady, with a large local consumption. Coke is stiffer in price; and sales for export have been made at 29s. per ton, free on board in the Tyne. Several cargoes of gas coke have lately been shipped to Amsterdam and other places. The demand is very large, and has forced up the price; upwards of 13s. per ton at the gas-works being freely paid.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

A discussion took place before Lord Wellwood in the Court of Session yesterday upon the question of whether the action by George Mackay and Co., brewers, against the Edinburgh and Leith Corporations' Gas Commissioners should be sent to a jury, or should be tried by the judge without a jury. The action, it will be remembered, has reference to the alleged pollution of a brewery well in the neighbourhood of the gas-works. The Commissioners are anxious that the judge should hear the case; while the pursuers prefer to have it tried before a jury. His lordship took time to consider the arguments before disposing of the question.

At the monthly meeting of the Dundee Gas Commission on Wednesday, the subject of the quantity of gas consumed in the gas-works came up for discussion. It was explained that the large consumption existed in the retort-house, where the lights required to be kept burning all day. The possibility of lighting the retort-house by constructing a sunk area outside the building had been considered; but the proposal was impracticable for want of space. The report of the Committee who were appointed at the last meeting to visit the gas-works and inquire into the consumption of gas at the works, was that they found everything in good order. They were satisfied that no undue use existed in connection with gas consumed within the works. They had examined all the meters within the works, and had found them all with one exception numbered as per pass-books and register of meters given out, as submitted to the Commission at their last meeting. This report was considered satisfactory, and was adopted. A report was also before the Commission, with reference to Mr. M'Crae's analysis of the coal contracted for last year. This showed that the estimated make of gas was 411,358,219 cubic feet, and the average yield of 27·22-candle gas, 11,020 cubic feet per ton; while the actual make had been 406,341,800 cubic feet of 26·84-candle gas. The Commissioners rightly considered the result to be highty creditable to Mr. M'Crae.

It was reported to a Committee of the Edinburgh Town Council on Wednesday that the Board of Trade propose to fix the order of Local Authorities under the Electric Lighting Acts by placing Gas Commissions first, Police Commissions second, and Town Councils third. This is contrary to the view which the Edinburgh Town Council have taken of the matter, and the Committee resolved to instruct their Parliamentary Solicitor accordingly. This means that the Edinburgh Town Council are to fight the Board of Trade—a proceeding of which they had better be wary, unless they wish to be recklessly extravagant with the ratepayers' money.

Bailie Walcot and Treasurer Clapperton gave notice in the Edinburgh Town Council on Monday of a motion to inquire into the difference in the candle power of the gas as reported by the City Analyst and as reported by the Engineers to the Gas Commission. The inquiry is useless, as the answer is obvious when it is stated that the City Analyst's laboratory is one mile from the Edinburgh, and more than three miles from the Leith works.

North Berwick has turned its back upon the electric light; and so the little advertising scheme which was contemplated has fallen through. In a former note I expressed my fear that the Commissioners might hastily go into the scheme, without looking to the prospective cost; and I am glad to see that they have not been so foolish. What contributed most to their taking the stand they have done, or rather, perhaps, what led them to coquet with the electric lighting company at all, was a desire on their part to acquire the gas company's undertaking. Their intention was to work the two systems of lighting together; but to this proposal the electric lighting company would not agree, and the Commissioners resolved to stick to their original project with reference to the gas-works, setting the side issue of electric lighting out of account.

A case of gas poisoning, involving a whole family of six persons, is reported as having occurred in Arbroath yesterday morning. The inmates of the house were so much overcome that it was with difficulty they were able to communicate with neighbours. All of them, however, recovered in the course of the day. A gas-main in the street was found to be fractured; and the mishap is attributed to a steam-roller which the Police Commissioners had hired the use of from the Road Trustees, and which was at work in the thoroughfare the whole of the previous day.

Mr. Watson, the Engineer to the Dundee Water Commissioners, reported to the Commissioners on Thursday that the works for supplying Tayport (near Dundee) water had been completed. The water system is an extension of the supply to Newport, which is conveyed by steel pipes across the Tay Bridge,

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

At the monthly meeting of the Town Council of Glasgow, held on Thursday, an interesting discussion took place in reference to a proposal contained in a communication from the Lord Provost of Edinburgh to the effect that Glasgow and Edinburgh should co-operate in giving opposition to the railway rating schemes to be established under the provisions of the Railway and Canal Traffic Act, 1888. The Town Council of Edinburgh had agreed to contribute a sum not exceeding £300 towards defraying the expenses likely to be incurred in carrying on the opposition; and the Glasgow authorities were asked to name some representatives to join the Committee, and to make a contribution to the funds. It was reported by the Senior Magistrate (Bailie Mitchell) that at a meeting of the Magistrates' Committee held that day it had been unanimously resolved to guarantee a sum of £500 towards the expenses in connection with the movement, as the interest of Glasgow in the matter was much greater than that of Edinburgh. It was eventually agreed to give the powers asked; and to allow all the trusts represented in the Committee at Edinburgh to look after their respective interests.

Further important extensions at the Dumfries Corporation Gas-Works have just been resolved upon. The Town Council sitting as the Gas Commission on Thursday afternoon received a minute from the Gas Committee in which it was stated that, at their last meeting, the Manager (Mr. Malam) had produced a statement in regard to a proposed new retort bench of 5 ovens and 34 retorts. The construction of the regenerators recommended to be adopted in the new bench was the patent of Mr. George R. Hislop, Engineer of the Paisley Gas-Works, from which system great saving of fuel was sure to be made, as from his (the Manager's) experiments with simple forms of gas firing, nearly £100 worth of coke extra was sold during 1888-9. The coke sales showed that about 60 per cent. was used as fuel for retort furnaces; and if 40 per cent. was used for the new bench, a saving of £275 per annum would be effected, taking the coke at the present price. Estimating the cost of the bench at £1200, three years would repay the cost. On the motion of Mr. Currie, seconded by Treasurer Glover, the Committee agreed to recommend the Commission to authorize the erection of the new retort bench on Mr. Hislop's regenerative system. The Committee also agreed to recommend the acceptance of a number of tenders for the work, including retort mouthpieces from Messrs. Tangyes Limited. It was stated that the cost of the new bench would be £1302, including a royalty of 30s. per retort to Mr. Hislop. At the same meeting of the Committee, a statement of the results of the work done at the gas-works from May 15, 1889, to Jan. 16, 1890, was submitted by the Manager, with which the Committee expressed satisfaction. He stated that the total amount of gas made during that period was 35,899,600 cubic feet, being an increase of 1,069,300 feet, compared with the amount made in the corresponding period of the preceding financial year. The quantity of coals used was 3525 tons, an increase of 155 tons—the average yield of gas being 10,184 feet per ton, against 10,335 feet in the same period of the year 1888-9. The average cost of coals was 14s. per ton, being a decrease of 2s. per ton; and the gas rents—at 3s. 6d. per 1000 feet—had realized £5461 5s. 10d., being a decrease of £256 6s. 2d., owing to a reduction in price. There had been a very material increase in the revenue from the sale of gas char; but that from tar and ammoniacal liquor showed a slight falling-off. Provost Scott, in moving the adoption of the report, said that they would, no doubt, think £1302 was a large sum for the new retort bench; but in four years the sum would be saved, and they would then be working at a clear profit. Mr, Currie seconded the motion, and the report was adopted.

Before leaving this question of the experiment with Mr. Hislop's regenerative system of setting retorts, I may mention that it has also quite recently been adopted by the Ayr Gas Company. In both cases all the recently-patented arrangements for filling the producers directly from the retorts will be adopted. It may now confidently be expected that at the next annual meeting of the Ayr Gas Company, the Directors will be able to see their way to announce a reduction in the price of gas—that is to say, if the production of gas is to be on such an economical scale as is anticipated at Dumfries; and if so it will quite justify Mr. Hislop in claiming that he has made a very decided step forward in gas manufacture, for if his system can be advantageously adopted in such gas-works as those of Ayr and Dumfries, it will prove suitable for small works generally.

I am informed that, in view of the stiff fight that is likely to open very shortly in Parliament in reference to the local gas and electricity Bills and the Bill for the extension of the municipality of Glasgow, so as to include in it the Burghs of Partick, Hillhead, Maryhill, &c., Mr. George Livesey and Mr. Charles Hunt, of Birmingham, have this week visited Glasgow for the purpose of giving their advice as experts regarding the position which the municipal authorities should take up when the Bills come before the Parliamentary Committees. If I am not mistaken, Mr. Corbet Woodall is to be engaged as the leading professional expert on the other side. On both sides the decks are being cleared for the fight.

A Glasgow report of the sulphate of ammonia market for the week ending March 8, states that the market closed a shade firmer, and a little more business has been passing. Makers will not sell under £11 17s. 6d. f.o.b. Leith; but middlemen are in some instances ready to accept a shade less—£11 15s. to £11 16s. 3d. There is no change to report in the position of the market for forward delivery.

The Glasgow pig iron market has again been flat during the past week, and prices have receded all round—Scotch warrants being down at 50s. per ton yesterday, as compared with 52s. on Monday. The closing price yesterday afternoon was 50s. 4d. cash buyers. There have been very large withdrawals of iron from the public warrant stores. For the five days ending last night they amounted to 9908 tons.

There is a somewhat better business doing in the local coal trade this week, and buyers are more disposed to concede the terms asked by sellers. Full prices have been maintained in the export department. The miners are generally working very steadily at the collieries, the only drawback being a want of empty waggons now and again.

Sale of a Village Gas-Works.—The small gas-works at Debenham (Suffolk), "with the foreman's house and buildings, gasholder, &c., in working order, gas-lamps, &c.," were put up to public auction last Wednesday, and realized for the vendors the sum of £135!

The Coze Syndicate, Limited.—This Company was registered last week with a capital of £10,000, in £100 shares, to carry out an agreement, made on the 17th ult., between the Mercantile Agency Company, Limited, and Mr. W. M. Knight on behalf of the Company; and to acquire lands, buildings, and hereditaments in England for any purpose of the Company.

The Railway Siding for the Coventry Corporation Gas-Works.—In accordance with the spirit of the amendment to the Gas Committee's report on this subject recently passed by the Coventry City Council, the Deputy-Mayor (Alderman Tomson), at the last meeting, proposed that a Committee be appointed to consider and report as to the best method of procedure in order to more thoroughly examine what was known as "Scheme No. 2," or any other alternative scheme for a railway siding for the use of the gas-works, whereby if practicable any collision with the trustees of the Bablake School might be avoided. He said he did not propose to refer the matter back to the Gas Committee, because he knew it would not be agreeable to them to do so. The Committee were still of opinion that their plan (known as No. 1 scheme) was the cheapest and best; and they regretted the opposition it had evoked. Mr. Hill seconded the motion, which was carried.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 8.

Sulphate of Ammonia.—There has been a rather good demand during the past week; and for the last few days £11 17s. 6d. has generally been obtainable for prompt parcels. Best makes are again held for £12; and it will entirely depend upon the immediate requirements, whether or not such a price will be realized. It is perfectly clear from the movements of the "bears," that they are considerably oversold; and that moreover they cannot manage to delay their purchases for long. There is too little prompt sulphate available in the country to allow their efforts to depress the position to be crowned with success. There is some improvement in the Continental demand; and fair sales are reported to France and Belgium on the parity of present values. With the close approach of spring, too, these inquiries are sure to become more urgent, and increase in quantity. It is also a good sign that, for March delivery at all events, the cheap offers of the speculators have to a great extent ceased. The tone of the nitrate market is a little firmer; and the statistical position has somewhat improved. The visible supply on the 1st of January showed an excess of 165,000 tons, which excess on the 1st of March was reduced by upwards of 130,000 tons; leaving the present surplus only between 30,000 and 40,000 tons. A consumption equal to that in 1887 would bring down the figures to a par of previous years. As Aug.-Nov. shipment has been done at 8s. 4d. to 8s. 6d. per cwt., this may be taken as a safe indication that a lower range of prices is hardly anticipated.

LONDON, *March* 8.

Tar Products.—There is undoubted dulness in this market; and very little business has been transacted during the week. Prices appear to be "shading off." The following are the quoted prices of to-day; and in many instances they are nominal, owing to the small amount of business actually being done:—Tar, 25s. to 31s. 6d. per ton, according to position. Benzol, 90 per cent., 3s. 10d. per gallon; 50 per cent., 2s. 10d. Toluol, 1s. 10d. per gallon. Solvent naphtha, 1s. 8d. per gallon. Crude naphtha, 1s. 2½d. per gallon. Light oil, 4½d. per gallon. Lucigen oil, 3d. per gallon. Ordinary creosote, 2½d. per gallon. Carbolic acid, 2s. 9d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 5d. per unit; "B" quality, 1s. 2d.

Sulphate of Ammonia.—This market is also slack; and lower prices are quoted. Buyers are all of one mind in withholding purchases, and makers who are not sold are becoming a little anxious as to the future. A few weeks, however, should see a more active demand for home consumption; and this it is expected will neutralize the depressing tactics of Continental shippers. Varying prices are named to-day, ranging from £11 10s. to £11 15s., according to position and conditions as to bags and delivery.

Lothammer Gas Company, Limited.—In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Chitty had before him an application to appoint a provisional liquidator of the Lothammer Gas Company; limiting his duties to certain pressing matters. Mr. Romer, Q.C., who supported the application, said it was a perfectly friendly one, and was made in the interests of all the shareholders. The applicant was only a small shareholder, and he was taking the present course in order that the property of the Company might be protected. His Lordship made the order.

Gateshead Public Lighting.—At the meeting of the Gateshead Town Council last Wednesday, the Watch Committee reported that they had considered a communication from the Gas Company, stating that they did not intend in future to allow discount off the account for gas against the Corporation unless the whole of the street lamps were lighted all the year round, when 7½ per cent. would be allowed. The system in vogue was that of partial lighting in the summer months. The Committee recommended the adoption of a system of full lighting of the streets during the entire year. The report was approved.

The Gravesend Gas Company's Bill.—The *South Eastern Gazette* states that yesterday week the Directors of the Gravesend Gas Company and the Parliamentary Committee of the Gravesend Corporation had a conference respecting the Bill of the former. The meeting was *in camera*; and so far as our contemporary has been able to gather, very satisfactory terms were agreed upon. Several points were conceded the Corporation. On the result of the accountant's investigations into the accounts, the question of surplus profits was discussed; and it is believed the Company will consent, or have practically consented, to return the sum of £7000, applicable in reduction of the price, in ten annual payments of £700 each to the Corportion, in the interests of the burgesses. The price of gas was also gone into, and it is understood that there was a promise of a reduction. It was agreed that the capital to be raised by the Company's Bill should be £25,000.

The Bolton Corporation's Gas Coal and Lime Contracts.—As already mentioned in the JOURNAL (*ante*, p. 201), a Sub-Committee has been appointed by the Gas Committee of the Bolton Corporation to inquire into the quality of the coal and lime supplies. As a result of this action, Mr. Stredder withdrew the motion of which he had given notice for last Wednesday's meeting of the Town Council. He proposed to ask for a return of the names of the contractors who, as appeared from the report of the Gas Manager (Mr. W. Smith), have supplied coal "very inferior and much below the average," and also of those who have sent in lime which when tested showed only 57·35 per cent. of carbonate of lime, instead of from 90 to 95 per cent. The inquiry was also intended to elicit a statement as to the quantity of this very inferior material, the amount of the loss sustained by the Corporation in the four months ending Jan. 31 last, and the steps taken to obtain compensation for the loss. The Sub-Committee's investigations are taking a wider scope, and will cover the whole of the past twelve months. Several meetings have been held; and it is reported to have been established that the quality supplied has in many instances not been up to sample, though the responsibility for this state of things is said to be not at present ascertained. Further meetings are to take place. It was alleged by Mr. Kirkman at the meeting of the Council last month, that the loss through the inferior quality of the coal was £3000 a year, and that the Gas Committee had neglected to attend to the matter despite the report of the Manager.

A Sign of the Times.—Tenders are being invited for mechanical stokers for the Bradford Road works of the Manchester Corporation Gas Department, where the whole of the stoking is at present done by hand labour.

The Revenue of the Manchester Corporation Gas Undertaking.—In consequence chiefly of the recent strike in the carbonizing department, and the curtailment of the supply which the strike entailed, it appears probable, says a Manchester paper, that the consumption of gas in Manchester during the year which ends on the 25th inst. will show a falling off of from 3 to 4 per cent. as compared with last year. The reduction in the price of gas which took place in the autumn, the limitation of the hours of labour, and the increased cost of materials of all kinds, have also had an adverse influence on the revenue of the Gas Committee for the year now closing. It was some time ago decided to hand over to the city fund, out of the surplus profits of the year, a sum of £30,000; but, as a matter of fact, the surplus profits are not likely to reach this figure. A considerable portion of the £30,000 will therefore have to be put to a suspense account. The prospect for the coming year cannot be said to be much more cheerful. Indeed, if the Local Government Board and Parliament comply with the application which is now being made to them for the extension of the city boundaries, it seems improbable that there will be any profits at all next year, if the price of gas is not raised. One of the conditions on which the surrounding townships are to be brought into the city is that they shall have the price of gas supplied to them from the Corporation works reduced from 3s. to 2s. 6d. per 1000 cubic feet; the latter being the price paid by the consumers within the city. This reduction of 6d., presuming that all the townships are brought in, will make a difference of £9554 per annum in the Gas Committee's revenue from the private consumers in the out-townships. The gas for the street lamps in the city is at present supplied "free of charge;" in other words, the gas consumers and not the citizens generally have to pay for it. If the same course is followed with regard to the public lamps in the out-townships, the result will be the expenditure of £7738. The question arises, and will have to be faced by the Gas Committee, how is this £17,292—the two sums above mentioned—which will come out of the revenue, to be made good. It is considered unlikely that it will be found necessary to raise the price of gas.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

For Stock Market Intelligence, see *ante*, p. 431.

Issue.	Share	When ex-Dividend.	Dividend & or Div. Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	18—19	+½	5 10 6
100,000	10	,,	7½	Do. 7 p. c.	10	12¾—13¼	..	5 11 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	108—110	..	4 10 11
100,000	20	28 Nov.	8	Bahia, Limited	20	19½—20½	..	7 16 1
200,000	5	14 Nov.	7½	Bombay, Limited	5	6—6¼	..	5 15 4
40,000	4	,,	7½	Do. New	4	4⅞—5⅛	..	5 17 10
380,000	Stck.	27 Feb.	12½	Brentford Consolidated	100	213–218*	..	5 12 5
125,000	,,	,,	9½	Do. New	100	155–160*	..	5 15 7
220,000	20	12 Sept.	11	Brighton & Hove Original	20	41—43	..	5 2 4
320,000	20	27 Sept.	11½	British,	20	43—45	..	5 0 0
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	12¾—13¼	−⅛	5 8 2
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	105—108	..	5 11 1
150,000	20	27 Feb.	8	Cagliari, Limited	20	25—27*	..	5 18 4
550,000	Stck.	16 Oct.	13¾	Commercial, Old Stock	100	249—254	..	5 8 3
130,000	,,	,,	10¾	Do. New do.	100	200—210	+7½	5 2 4
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	5 13 2
557,320	20	12 Dec.	13	Continental Union, Limited.	20	46—47	..	5 10 8
242,680	20	,,	13	Do. New '69 & '72	14	31—33	..	5 10 3
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	30 Jan.	13	European, Limited	10	23—25	..	5 4 0
120,000	10	,,	13	Do. New	5	7½ 17½—18½	..	5 5 3
354,060	10	,,	13	Do. do.	5	11½—12½	..	5 4 0
5,470,620	Stck.	13 Feb.	13¾	Gaslight & Coke, A, Ordinary	100	247—252	+4	5 9 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—103	..	3 17 8
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	..	3 18 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	121—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	180—185	..	4 1 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	158—163	+1	4 5 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	247—252	..	3 19 4
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	114—117	..	3 8 5
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—127	..	3 10 10
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170	..	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	211—216	+1	5 11 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	114—116	..	4 6 2
541,920	20	28 Nov.	6	Monte Video, Limited.	20	18½—19½	..	6 3 1
150,000	5	28 Nov.	10	Oriental, Limited	5	8½—9	..	5 11 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5⅞—6⅛	..	5 12 0
166,870	10	26 July	4	Pará Limited.	10	3⅜—4⅜	..	8 17 9
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14½—15½	..	6 9 2
500,000	Stck.	27 Feb.	13½	South Metropolitan, A Stock	100	275–285*	..	4 12 11
1,350,000	,,	,,	11½	Do. B do.	100	220–230*	+5	5 0 0
141,500	,,	,,	12	Do. C do.	100	230–240*	..	5 0 0
650,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—142	..	3 10 5
60,000	5	27 Feb.	11½	Tottenham & Edm'nton, Orig.	5	11—13*	..	4 8 5
				WATER COMPANIES.				
728,440	Stck.	30 Dec.	9½	Chelsea, Ordinary	100	260—263	..	3 11 8
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	211—213	..	3 9 9
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	143—148	..	3 0 10
700,000	50	12 Dec.	9	Grand Junction	50	122—127	..	3 10 10
708,000	Stck.	13 Feb.	10½	Kent	100	271—276	+1	3 16 0
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	254—258	..	3 13 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	123—128	..	3 2 6
500,000	100	13 Feb.	12½	New River, New Shares	100	360—363	..	3 6 5
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk	100	127—130	..	3 1 6
902,300	Stck.	12 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	164—169	..	11 0
126,500	100	,,	6	Do. 7½ p. c. do.	100	163—168	..	3 11 5
155,066	Stck	12 Dec.	10	West Middlesex.	100	260—265	..	3 15 6

*Ex. div.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

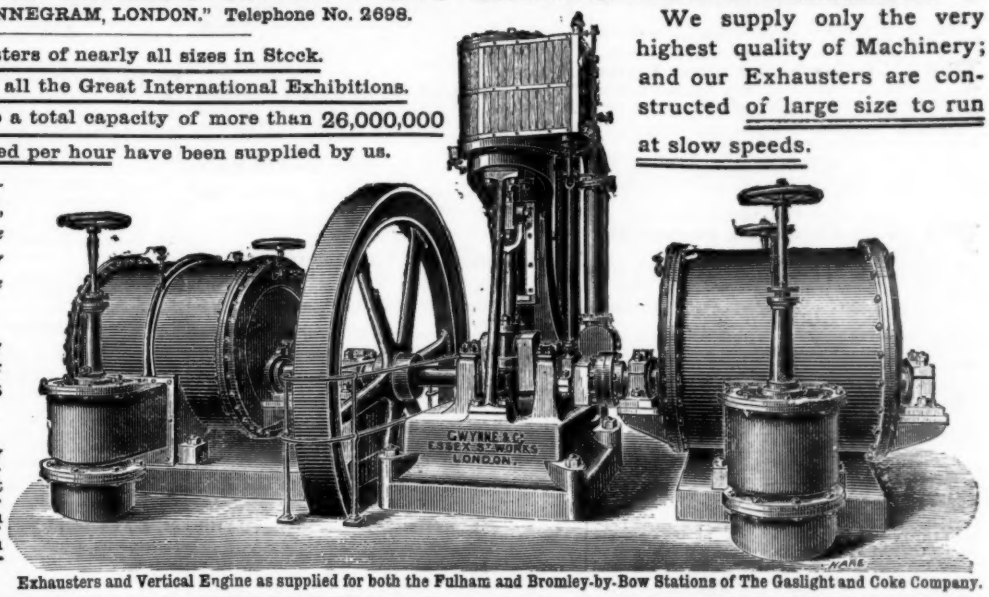
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAYS.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
No. 64, BERNARD STREET, LEITH, }

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

ADVERTISER, Son of a Gas Manager, 28, total abstainer, seeks position as MANAGER of small, or ASSISTANT MANAGER of large Gas-Works. Good practical knowledge of the Manufacture and Distribution of Gas; and fair knowledge of Chemistry and Draughting. Excellent references.
Address No. 1800, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A Young Man, 20, seeks any Position of Trust on a Gas-Works. Has passed Honours in City and Guilds Examination in Gas Manufacture. Understands the Manufacture of Sulphate of Ammonia, and the general routine of Gas Manager's Assistant. Can be well recommended.
Apply, by letter, to No. 1795, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a competent Man, a Situation as SERVICE LAYER, METER FIXER, INDICE READER, &c. Eleven years in last Situation.
Address A. B., 16, Station Street, STRATFORD, E.

TAR AND AMMONIA WORKS.

WANTED, a position as Works Manager or FOREMAN in large Works. Ten years' experience, good references. Salary moderate. Age 35.
Address A. G. BURTON, Milton, near STOKE-ON-TRENT.

WANTED, by a large Provincial Gas Company, an ASSISTANT RENTAL CLERK.
Apply, by letter (stating age and salary required), to No. 1801, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT Manager wanted by the Winchester Water and Gas Company. Must be a good Carboniser, and have a practical knowledge of the usual routine of a Gas-Works.
Salary £150 per annum, with House, Light, and Coal free.
Apply, by letter, before the 17th inst., stating age, qualifications, and present employment, with testimonials, endorsed "Assistant Manager," to the DIRECTORS, Water and Gas Company, WINCHESTER.

TIMMIS & CO., of STOURBRIDGE' Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats.
All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.
Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gas-holders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 419 of last week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 306.
Inquiries should be addressed to THE COZE SYNDICATE, LIMITED, 86-88A, LEADENHALL STREET, E.C.

WANTED, a Main and Service Layer for a Provincial Gas Company. Constant employment.
Apply, by letter, to No. 1799, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a leading Stoker, who understands Exhauster, Pressure Governors, &c. Wages 36s. 9d. per week.
Applicants to state age and experience to MR. DICKINSON, Manager, Gas-Works, HINDLEY.

GAS-WORKS FITTER.

WANTED, a Fitter who thoroughly understands fixing Hydraulic Main and Ascension Pipes, and all the routine Fitting Work in a Gas-Works. Permanent employment for a good workman.
Apply, by letter, to No. 1798, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, in consequence of the death of the late Manager of the Gas-Works at Bromley, Kent, an ENGINEER and MANAGER to take charge of the Works, and devote his whole time to the duties of his Office. The present make of Gas is about 140 million cubic feet per annum.
Salary, to a thoroughly competent man, £500 per annum.
Applications, endorsed on the cover "Gas Manager," stating age, qualifications, and experience, with (not more than) three *recent* original testimonials of character and ability, and the earliest date at which the Candidate would be prepared to enter on his duties, to be sent to the Chairman, at the Works, on or before Thursday, the 20th of March inst.
Gas-Works, Bromley, Kent,
March8, 1890.

IRISH BOG ORE OXIDE OF IRON.
GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
190 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys*
Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

C. T. LAWS & SONS beg to call the attention of Engineers and Managers to their Latest IMPROVED RETORT SETTINGS. The largest make per Mouthpiece ever produced. A trial solicited.
Address 14, Ferrier Street, York Road, WANDSWORTH.

WANTED, a good Second-hand Station METER, to pass about 2000 feet per hour.
Apply to the MANAGER, Gas-Works, AUCHTERARDER.

ON SALE—The "Journal of Gas Lighting" for 1884, 5, 6, 7, 8, and 9. Complete, clean, and in good condition. Also for 1881 and 1883 (five Numbers short).
Offers to JOHN JOHNSON, Gas-Works, Halesowen, near BIRMINGHAM.

FOR SALE—Two Small Purifiers, 6 ft. 9 in. by 3 ft. by 3 ft. 5 in. deep, with Divisions in the middle, and Four-Way Valves. They will require new Lids; but the rest are in good condition.
Particulars may be had by applying to Mr. E. H GILBERT, Gas-Works, Earl Shilton, near HINCKLEY.

GASHOLDER COLUMNS.

FOR SALE—Ten of the above, 32 feet high, by 2 ft. 6 in. diameter, with Ornamental Caps and Bases; also ten WROUGHT LATTICE GIRDERS for same, suitable for 100-feet Tank. A Bargain.
Address Messrs. H. MOBBS AND CO., Vulcan Works, NORTHAMPTON.

CAST AND WROUGHT IRON TANKS AND PURIFIERS.

THE under-mentioned Tanks for dis- posal:—

1	Cast-Iron Tank,	15 ft. 8 in.	dia. by 11 ft.	4 in. deep.
1	" "	15 ft. 8 in.	" 8 ft.	6 in. "
1	Wrought-Iron Tank,	8 ft.	" 7 ft.	0 in. "
1	" "	8 ft.	" 6 ft.	0 in. "

Also Two good CAST-IRON PURIFIERS, 8 feet square, with Connections; almost equal to new.
Apply to J. HEPWORTH, Gas-Works, CARLISLE.

FOR SALE—One Single Gasholder, 80 feet by 20 feet (owing to extensions at Blackpool). To be erected complete; in first-rate condition.
Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

FOR SALE—In good condition, 28 Circular RETORT MOUTHPIECES, 15 inches diameter.
Offers to be sent to Mr. JAMES LEE, Gas-Works, Eccleshill, near BRADFORD.

FOR SALE—One 8-horse power Engine and COAL BREAKER, with top and bottom Elevator, Gear, and Patent Wrought-Iron Chain, with Malleable Iron Buckets complete.
The above Machinery is almost new, having only been in use about Three months.
For further particulars, apply to the COAL DISTILLATION COMPANY—COOPER'S PATENTS—LIMITED, 322 and 323, Winchester House, Old Broad Street, LONDON, E.C.

HEYWOOD CORPORATION.

FOR SALE—The whole or portion of the following:—
21 OVAL RETORTS, 18 in. by 13 in. by 8 ft. 6 in. long, and 39 ∩ RETORTS, 16 in. by 13 in. by 8 ft. 6 in. long.
Further particulars upon application to Mr. W. Whatmough, Gas Manager.
Applications to be sent to me, marked "Retorts," not later than Six p.m., on Wednesday, the 19th day of March, 1890.

By order,
ALFRED WALLIS, Town Clerk.
Municipal Buildings, Heywood,
March 3, 1890.

GAS SHARES.

DIVIDEND 10 PER CENT.

MR. ALFRED RICHARDS will Sell by Auction, at the Swan Hotel, Stratford, on Tuesday, March 18, 1890, at Seven o'clock punctually, in Lots 139 FULLY PAID £5 SHARES in the WEST HAM GAS COMPANY, paying 10 per cent. Dividend; but under the Company's Act of 1889, a higher Dividend can be paid as the price of Gas is reduced.
Particulars of the AUCTIONEER, TOTTENHAM; and 8, NEW BROAD STREET, E.C.

SALE OF NEWPORT (MON.) GAS SHARES.
(UNDER THE COMPANY'S ACT, 1886.)

MR. RICHARD B. EVANS has received instructions from the Directors to SELL BY PUBLIC AUCTION, at the King's Head Hotel, Newport, on Wednesday, the 19th day of March, 1890, at Three o'clock in the Afternoon punctually, SIXTY CLASS "C" SHARES OF £100, in 60 Lots of One share each. The statutory Dividend is 7 per cent. per annum.
Particulars and conditions may be had on application to the AUCTIONEER, No. 30, Bridge Street, NEWPORT; or to Mr. EDWARD MARTLEET, Secretary, at the Offices of the Company, Newport, MON.
Dated Feb. 7, 1890.

TOTTENHAM & EDMONTON GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £10,000 NEW STOCK, 1882.

IN pursuance of the Tottenham and Edmonton Gas Act, 1882, Notice is hereby given that it is the intention of the Directors of the Company to SELL BY TENDER £10,000 of NEW STOCK of the Company, to be paid up in full on or before the 1st day of May next; such STOCK being a portion of additional Capital, authorized to be raised by resolutions passed at an Extraordinary Meeting of the Proprietors, held on the 22nd day of February, 1890, under the powers of the above-mentioned Act.
Particulars and conditions of tender may be obtained on application to this Office; and sealed tenders must be sent in not later than Four o'clock in the Afternoon, on Monday, the 31st day of March next.

By order of the Board,
JAMES RANDALL, Secretary.
Offices of the Company:
Willoughby Lane, Tottenham,
Feb. 28, 1890.

By Order of Mortgagees and Liquidators.
MABLETHORPE, LINCOLNSHIRE.

MESSRS. HEPPER AND SONS will SELL BY AUCTION, in their Estate Sale Room, East Parade, Leeds, on Tuesday, the 1st day of April, 1890, at Three o'clock in the Afternoon precisely (subject to Conditions of Sale to be then read), the
MABLETHORPE GAS-WORKS,
Situate on the Louth Road, in Mablethorpe St. Peter's, in the County of Lincoln.
The Works are erected on a piece of Land containing 2420 square yards or thereabouts, leasehold for 99 years, from the 21st of September, 1882 (ground rent of £10 per annum), and comprise the following:—
Brick Retort-House, with Iron Roof, 36 ft. by 27 ft., containing two Beds of Retorts, &c.; also Set of Condensers.
Brick, Coal, and Lime Sheds; Store-House, Purifying-House; Gasholder, with Brick Tank, capable of holding about 7000 cubic feet, and Tar Tank; Manager's Residence; Gas Mains and Pipes; Machinery; and Fixtures on the Land.
The Distributing Plant (consisting of about five miles of 4-inch and half-a-mile of 3-inch Gas-Mains), Public Lamps, Gas-Meters, Piping, Gas Cooking-Stoves.
The Purchaser will be required to take at a valuation the Coal, &c., particulars of which may be obtained as below.
The Works are situate about 600 yards from the Mablethorpe Railway Station. They have only been erected some Seven years, and are well-built and thoroughly adapted for the purpose of supplying the favourite Watering Places of Mablethorpe, Sutton-on-Sea, and the adjacent Villages, to which Mains are laid.
Further particulars may be obtained from, and the Conditons of Sale may be inspected on application to the Auctioneers, or the under-mentioned Solicitors, at any time prior to the Sale.

C. JAMES TODD,
Solicitor, Hull;
SCOTT AND COOPER,
Solicitors, Hull.

FOR SALE—A 7-inch Governor by Braddock. In perfect working order; equal to new; in use Six years. Will be ready in about Six weeks.
For price and particulars, apply to JOHN A HARRIS, Manager, Gas-Works, WIGSTON.

CAST-IRON TANK AND GASHOLDER FOR SALE.

THE Rugby Gas Company invite Offers for a CAST-IRON TANK, with its GASHOLDER, 62 feet in diameter and 14 feet deep, in good condition, and in use at their old Works.
Apply to Mr. P. SIMPSON, the MANAGER.
Rugby, March 10, 1890.

THE Ballymena and Harryville Gaslight Company, Limited, invite TENDERS for from 1000 to 1500 tons of best screened GAS COAL, free on Wagons at Larne Harbour; to be delivered before the 1st of November next.
Payment to be made on the first Monday in March, 1891.
Tenders to be lodged with me on or before (Ten o'clock) Monday, March 24, inst.

T. C. C. HOOD, Secretary.

SPENT OXIDE.

THE Woolton Gas Company are prepared to receive OFFERS for about 70 tons of SPENT OXIDE.
Samples and particulars may be had on application to the undersigned.
Tenders to be addressed to the Chairman of the Gas Company, Woolton, near Liverpool, on or before March 21.

HENRY HATCH, Manager.
March 1, 1890.

TAR.

THE Directors of the Reading Gas Company are prepared to receive TENDERS for the purchase of their TAR for One year, from the 1st of April next.
Specifications for the contracts can be seen at my Office, or will be sent on application.
Rail and Water Communication direct to the Works.
Tenders to be sent not later than Monday, the 17th of March, to

ROBT. BRADLEY, Secretary.
Office: 22, Market Place, Reading,
Feb. 25, 1890.

TENDERS FOR TAR AND LIQUOR.

THE Rugby Gas Company are prepared to receive TENDERS for the surplus TAR and LIQUOR made at their Works, for either One, Two, or Three years, commencing the 31st of March.
Tenders to be sent in, under cover, to the undersigned, on or before Thursday, the 3rd of April.
The Directors do not bind themselves to accept the highest or any tender.
Particulars may be had from

P. SIMPSON, Manager.
Rugby, March 5, 1890.

HAWORTH LOCAL BOARD OF HEALTH.

THE above Local Board are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR, from March 25, 1890, to March 25, 1891, delivered at the Gas-Works, Haworth, and similar tenders delivered on Rails at Haworth Railway Station.
Tenders, marked "Tar and Liquor Tender," to be sent in to me, the undersigned, not later than March 27, 1890.

By order,
R. H. WHITELEY, Manager.
Haworth, March 8, 1890.

BOROUGH OF DARLINGTON.

SPENT OXIDE.

THE Gas-Works Committee invite Offers for the purchase of about 100 tons (more or less) of SPENT OXIDE.
Samples and particulars may be had on application to the Gas-Works Engineer, Town Hall.
Tenders, endorsed "Tender for Spent Oxide," to be sent to me not later than the 20th inst.
No pledge is given that the highest or any offer will be accepted.

By order,
F. T. STEAVENSON,
Town Clerk.
Darlington March 7, 1890.

BOROUGH OF DARLINGTON.

THE Gas-Works Committee invite Tenders for the supply of 100 tons of PEROXIDE OF IRON for Gas Purification, delivered at the Darlington North Road Station. Delivery to extend over a period of not exceeding Six months from the acceptance of the tender.
Tenders (accompanied by samples, and a guarantee that the amount of moisture therein contained will not be exceeded in bulk), endorsed "Tender for Oxide," must be sent to me not later than the 20th inst.
No pledge is given that the lowest or any tender will be accepted.

By order,
F. T. STEAVENSON,
Town Clerk.
Darlington, March 7, 1890.

THE Corporation of Middleton are prepared to receive TENDERS for the following ARTICLES required at their Gas-Works during the ensuing Year:—
Wet and Dry Gas Meters,
Gas and Steam Tubes and Fittings,
Retorts, Fire-Bricks, and Fire-Clay.
The Retorts to be delivered at the Middleton Railway Station, and the other Articles at the Gas-Works, Middleton (free of carriage).
Tenders, addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Wednesday, the 19th day of March, 1890, endorsed "Tender for Meters," "Tubes," or "Retorts," as the case may be.
Further particulars may be obtained from Mr. Hartley, Gas Manager.
The Corporation do not bind themselves to accept the lowest or any tender.

FREDERICK ENTWISTLE, Town Clerk.
Town Hall, Middleton, near Manchester,
March 3, 1890.

COLNE AND MARSDEN LOCAL BOARD.

THE Gas and Lighting Committee of the above Board invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR, to be produced at the Gas-Works, for One year, as and from the 25th of March, 1890.
Particulars may be obtained from the Manager.
Endorsed tenders must be sent to me on or before Saturday, the 22nd of March inst.

ALFRED VARLEY, Clerk to the Board.
Colne Lane, Colne, March 8, 1890.

SULPHURIC ACID.

THE Gas Committee of the Lancaster Corporation invite TENDERS for the supply of about 180 tons of B.O.V., made from Sulphur or Spent Oxide of Iron, and to be suitable for the Manufacture of Sulphate of Ammonia (Strength, 146° by Twaddell's Hydrometer), for a term of One year, from the 1st day of April next.
Sealed Tenders, endorsed "Sulphuric Acid," stating price per ton, in carboys, delivered as required on the Gas-Works' Siding, Lancaster, including carriage for the return of empties, to be sent on or before the 17th prox. to Thomas Swainson, Esq., Town Clerk Lancaster.

C. ARMITAGE, Manager.
Gas-Works, Lancaster,
March 6, 1890.

BOROUGH OF DARWEN.

TO TAR DISTILLERS, ETC.

THE Gas Committee are prepared to receive OFFERS for the purchase of all the surplus GAS TAR to be produced at their Works, for One, Two, or Three years, commencing April 1.
Coals carbonized: About 12,000 tons per annum.
Tar will be delivered into Contractor's Railway Tank-Wagons at the Corporation Private Siding.
Conditions and forms of tender, together with any further particulars may be obtained from Mr. T. Duxbury, Manager, Gas-Works, Darwen.
Sealed tenders to be delivered to me, marked "Tender for Tar," at or before Noon of the 24th day of March, 1890.

By order,
CHAS. COSTEKER, Town Clerk.

BOROUGH OF DARWEN.
(GAS AND WATER DEPARTMENTS.)

THE Corporation are prepared to receive TENDERS for the following:—
(1) 1000 feet of ∩ Retorts and 400 feet of Oval Retorts, together with the necessary Bricks, Blocks, Tiles, Clay, &c., for setting same.
(2) All the Cast-Iron Pipes and Mains required for both Departments for One year, ending March 25, 1891.
(3) All Lead, Lead Pipes, Block Tin, &c., for One year, ending March 25, 1891.
Forms of tender for each contract, and further particulars can be obtained on application to Mr. T. Duxbury, Manager, Gas-Works, Darwen.
Sealed tenders to be delivered to me, marked "Tender for Retorts," "Iron Mains," or "Lead," respectively at or before Noon of March 17, 1890.
The lowest or any tender not necessarily accepted.

By order,
CHAS. COSTEKER, Town Clerk.

BOROUGH OF BURTON-UPON-TRENT.

TO COLLIERY PROPRIETORS.

THE Gas Committee of the Corporation of the Borough of Burton-upon-Trent are prepared to receive TENDERS, from Colliery Proprietors only, for the supply of from 1000 to 20,000 tons (21 cwt. to the ton) of Best Screened GAS COAL; to be delivered in Sender's or Railway Company's Trucks at the Gas-Works' Railway Siding, Burton-upon-Trent, between the 1st day of April next and the 31st day of March, 1891.
The deliveries are to be made in such quantities and at such times as may be directed by the Manager.
Payments: Net cash, monthly.
Tenders, enclosed in an envelope, sealed and endorsed "Tender for Coal," are to delivered to me at or before Ten a.m. on Thursday, the 27th of March inst.
The Committee reserve to themselves the right of rejecting the lowest or any tender.

F. L. RAMSDEN,
Manager and Engineer.
Gas-Works, Burton-upon-Trent,
March 5, 1890.

SOUTHWARK & VAUXHALL WATER COMPANY.

SALE BY TENDER OF THE SUM OF £100,000 OF FOUR PER CENT. DEBENTURE STOCK.

THE Directors of the Southwark and Vauxhall Water Company are prepared to receive TENDERS for the sum of £100,000 of DEBENTURE STOCK of the Company.
The Stock now offered is a Second portion of the sum of £800,000 of Debenture Stock, authorized to be raised by the Southwark and Vauxhall Water Act, 1886, payable as follows:—£10 per cent. on application; £50 per cent., *plus* Premium, on the 29th of March; and the balance of £40 per cent. on the 10th of June, 1890; or at the option of the allottees on the 29th of March.
Interest will accrue from the 31st of March, on the amount paid previous to that date.
The Stock will be consolidated with the Company's existing 4 per cent. Debenture Stock, and will rank before the whole of the Company's authorized Stock and Share Capital, which is fully paid, and amounts to £1,518,000. The Interest thereon will have priority of payment over all Dividends or Interest on such Capital, and will rank *pari passu* with the Interest on all the Company's existing Debenture Stock.
For particulars, forms, and conditions of tender, apply at the Office of the Company, Southwark Bridge Road, S.E.
Tenders must be delivered at the Company's Offices, Southwark Bridge Road, not later than Twelve o'clock on Tuesday, the 18th day of March, 1890.

By order of the Board of Directors,
ALFRED JELLEY, Secretary.
Southwark Bridge Road, S.E.,
Feb. 25, 1890.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 26th inst., at half-past Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31st of December last.

NOTICE IS HEREBY ALSO GIVEN that the Transfer Books of the Company will be closed on the 15th and re-opened on the 27th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard, Lombard Street, London, E.C., March 7, 1890.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

JUST PUBLISHED. With 307 Illustrations. Crown 8vo. Price 10s. 6d.

ELECTRICAL ENGINEERING

FOR

Electric Light Artizans & Students

BY W. SLINGO,

Principal of the Telegraphists' School of Science, and Director of the Electrical Engineering Section, People's Palace, London;

AND A. BROOKER,

Instructor in Electrical Engineering at the Telegraphists' School of Science, and at the People's Palace, London.

LONDON:

LONGMANS, GREEN, & Co.

Now Ready, Fcap. 4to, Cloth, Gilt Lettered, with numerous Illustrations, price 7s. 6d., post free.

Practical Photometry:

A GUIDE TO THE STUDY OF THE

MEASUREMENT OF LIGHT.

By William Joseph Dibdin, F.I.C., F.C.S.,

Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

Chemist and Superintending Gas Examiner to the London County Council.

The aim of the Author has been to give a comprehensive account of the various methods of Photometry in daily use, and to make the book thoroughly practical by indicating the many precautions necessary for ensuring accurate results in photometrical work. The volume contains chapters on the History and Principles of Photometry; Horizontal, Radial, and Jet Photometers; Standards of Light; the Proposed Substitute for Candles; the Auxiliary Apparatus required in Testing Gas; the Examination and Adjustment of a Gas-Testing Photometer; and Colour and Stellar Photometry; together with an Appendix comprising the Notification of the Metropolitan Gas Referees, Tables for the Correction of Volume of Gas and Observations of Candles, and other matter useful to Photometrists.

London: WALTER KING, 11, Bolt Court, FLEET ST., E.C.

SEVENTH YEAR. Now Ready (Demy 8vo., Price 5s. 6d. post free),

THE COMPLETE REPORTS

OF THE

PROCEEDINGS

OF THE VARIOUS

DISTRICT ASSOCIATIONS OF GAS MANAGERS for 1889,

Forming a Companion Volume to the Transactions of The Gas Institute, with which it is uniform in size.

*** **THE VOLUMES for 1883 to 1888 ARE STILL ON SALE.**

LONDON:

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

Now Ready, Price 6s., Cloth Bound, Bevelled Boards,

THE GUIDE-FRAMING OF GASHOLDERS

AND OTHER PAPERS

CHIEFLY RELATING TO

STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.

BY

F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

Reprinted from the JOURNAL OF GAS LIGHTING, *&c. Fully Revised and Corrected by the Author, with many Additions.*

LONDON:

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

APPARATUS for ASCERTAINING HEATING POWER of COAL, COKE, & OTHER FUEL.

MANUFACTURED BY

JONATHAN WILKINSON, Gas Engineer,

Gas Examiner to the Sheffield and Rotherham Corporations, &c., &c.

Instructions are furnished with the Apparatus, which render the manipulation easy, and in the hands of any moderately careful person, will give MORE CORRECT results than can be obtained by any of the expensive, laborious, and intricate processes previously in use.

Apparatus, complete, in polished Mahogany Case lined with Cloth with additional Tests for Lignite, and Sulphuretted Hydrogen Gas, Test Tubes, Box-end Beam, and Glass Scales. } £5 10 0

IMPROVED PHOTOMETER DISCS.

J.W. solicits a trial of his Improved PHOTOMETER DISCS, which are prepared with great care, and made very sensitive to the difference in the reflected and transmitted light, enabling the operator to balance the light on both sides of the Disc with ease and accuracy.

Price of Single Disc, free by post, 1/7.
„ per Dozen „ „ 12/6.

JONATHAN WILKINSON, Gas Engineer, &c., Grimesthorpe, SHEFFIELD.

PATENTS FOR INVENTIONS,

REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

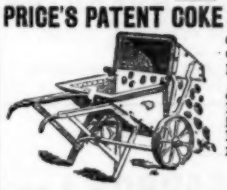
J. C. CHAPMAN,

Assoc.M.Inst.C.E., M.Inst.M.E., Fel. Inst. Patent Agents,
70, CHANCERY LANE, LONDON, W.C.

Special experience in Gas and Ammonia Plant.

NOTE ALTERATION OF ADDRESS.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

To effect a great saving in

GAS-FURNACES use our

Special Derbyshire GANNISTER BRICKS.

ADDRESS

JAMES WHITE & Co.,

ALBERT WORKS, WIDNES.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

MIRFIELD, NORMANTON.

SULPHURIC ACID.

THOMAS FARMER & Co.

(ESTABLISHED 1778),

The Oldest Manufacturers in the South of England,

Are prepared to supply Gas Companies with SULPHURIC ACID, of first-class quality, and also to treat for the Purchase of their

SULPHATE OF AMMONIA.

Offices: Dunster House, Mark Lane,
Works: Hall's Wharf, Victoria Docks, } LONDON.

CAST-IRON PIPES

FOR GAS AND WATER.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW.

Is now Ready, the Fifth Edition of the

HANDBOOK

FOR

Gas Engineers and Managers.

BY

THOMAS NEWBIGGING,

Member of the Institution of Civil Engineers.

The present Edition marks an important advance on those that have gone before. Considerable additions have been made to the text, and much of it has been re-written and otherwise improved. It extends to 524 pages, and contains 193 illustrations.

PRICE: MOROCCO, GILT, 18s.; CLOTH, 15s.; DELIVERED FREE.

LONDON:

WALTER KING, "JOURNAL OF GAS LIGHTING," ETC., 11, BOLT COURT, FLEET STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

GAS COAL.

POPE & PEARSON, LTD.,

have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12¼ cwt. of good coke.

This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

IMPROVED RETORT SETTING.

W. G. WALLER & Co.,
RETORT SETTERS & CONTRACTORS,

Having had much experience in the Setting of Retorts beg to call the attention of Gas Engineers and Managers to their Improved System of Setting Retorts and Tar-Furnaces.
Contractors for Building Shafts, Tanks, Retort Benches, and all other Buildings connected with Gas-Works.
Estimates on application.

The Poplars, Waddon, Croydon, Surrey.

THOMAS TURTON
AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

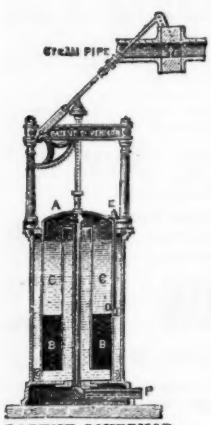
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

Newland Gas Coal

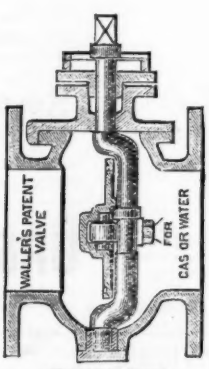
For particulars, apply to

LOCKE & CO.,
NORMANTON,
YORKSHIRE.

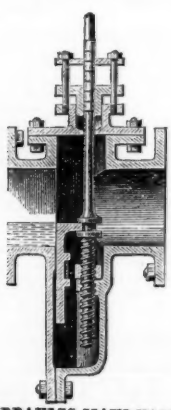
GEORGE WALLER & Co.'s NEW PATENT EXHAUSTER.
MADE WITH 4, 3, OR 2 BLADES.
Also BEALE'S EXHAUSTERS.

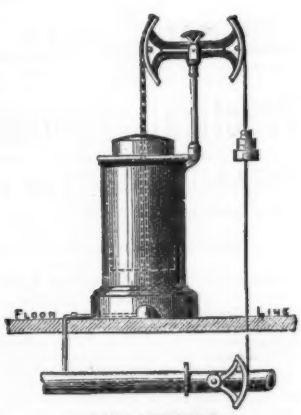


PATENT GOVERNOR.



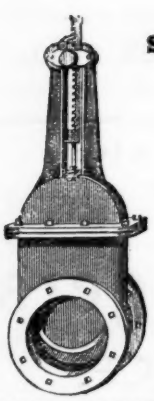
CRANK VALVE.

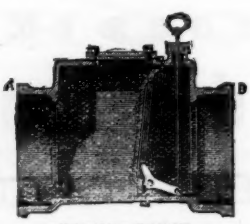

HYDRAULIC MAIN VALVE.



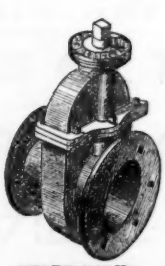
GAS GOVERNOR.

SCRUBBERS, PURIFIERS, CONDENSERS,
COKE-BREAKERS.

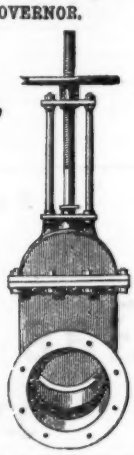

OUTSIDE RACK VALVE.



BYE-PASS VALVE.


INDEX VALVE.

DISC VALVE.


OUTSIDE SCREW VALVE.

SEE PREVIOUS ADVERTISEMENTS. ILLUSTRATED CATALOGUE ON APPLICATION.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.,

NEAR SOUTHWARK BRIDGE (FOUR MINUTES FROM HOLLAND STREET), AND AT

STROUD, GLOUCESTERSHIRE.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE, FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS. Proprietors of BEST GLASSHOUSE POT & CRUCIBLE CLAY, SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

THE ONLY RELIABLE
DRY CENTRE-VALVE.
WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.
ALSO MADE FOR TWO OR THREE PURIFIERS.
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.
Write for Prospectus.
ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.
F. WECK, 86, NEW STREET, BIRMINGHAM.

ROBERT HOLSWORTH,
103, BOSTON STREET,
HACKNEY ROAD, LONDON, N.E.
Telegraphic Address: "HOLSWORTH LONDON,"
MANUFACTURER OF
FLAT and ROUND HEMP and MANILLA ROPES, LINES, SCAFFOLD CORDS, SPUN YARNS, GASKETS, and TWINES of every description; COAL, COKE, and CORN SACKS, TARPAULINS and WATERPROOF COVERS, MATS, and MATTING.
CONTRACTS TAKEN.
ESTABLISHED, 1831.

JAMES NEWTON & SONS,
(Established 1820)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

GAS AND WATER PIPES.
1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.
ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
"SPRINGBANK GLASGOW."

MARQUIS OF LOTHIAN'S
NEWBATTLE CANNEL.
QUOTATIONS ON APPLICATION TO
MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·68 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO. 21, John St., Adelphi, LONDON, W.C.

Wrought-Iron

And Fittings and Accessories.
LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: T. LAMBERT & SONS, Short Street, LAMBETH.

FACE YOUR RETORT MOUTHPIECES.
JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.
Thousands in constant work, give universal satisfaction.
Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.
Main Drilling Stand, with Cup Drills, 1¼ to 6 inch; Taps, Rymers, and Drills.
Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides, &c.
Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to
JOHN RUSCOE, Albion Works, Hyde, near Manchester.

CAST-IRON PIPES, ETC.
THOMAS SPITTLE, LTD.
[ESTABLISHED OVER 50 YEARS.]
CAMBRIAN FOUNDRY, NEWPORT, MON.,
MAKERS OF
CAST-IRON PIPES FOR GAS, WATER, AND STEAM.
ALSO
Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.
ALSO ALL WROUGHT-IRON WORK.
THE LARGEST MAKERS IN WALES.

FULL PARTICULARS FROM THE PATENTEES,

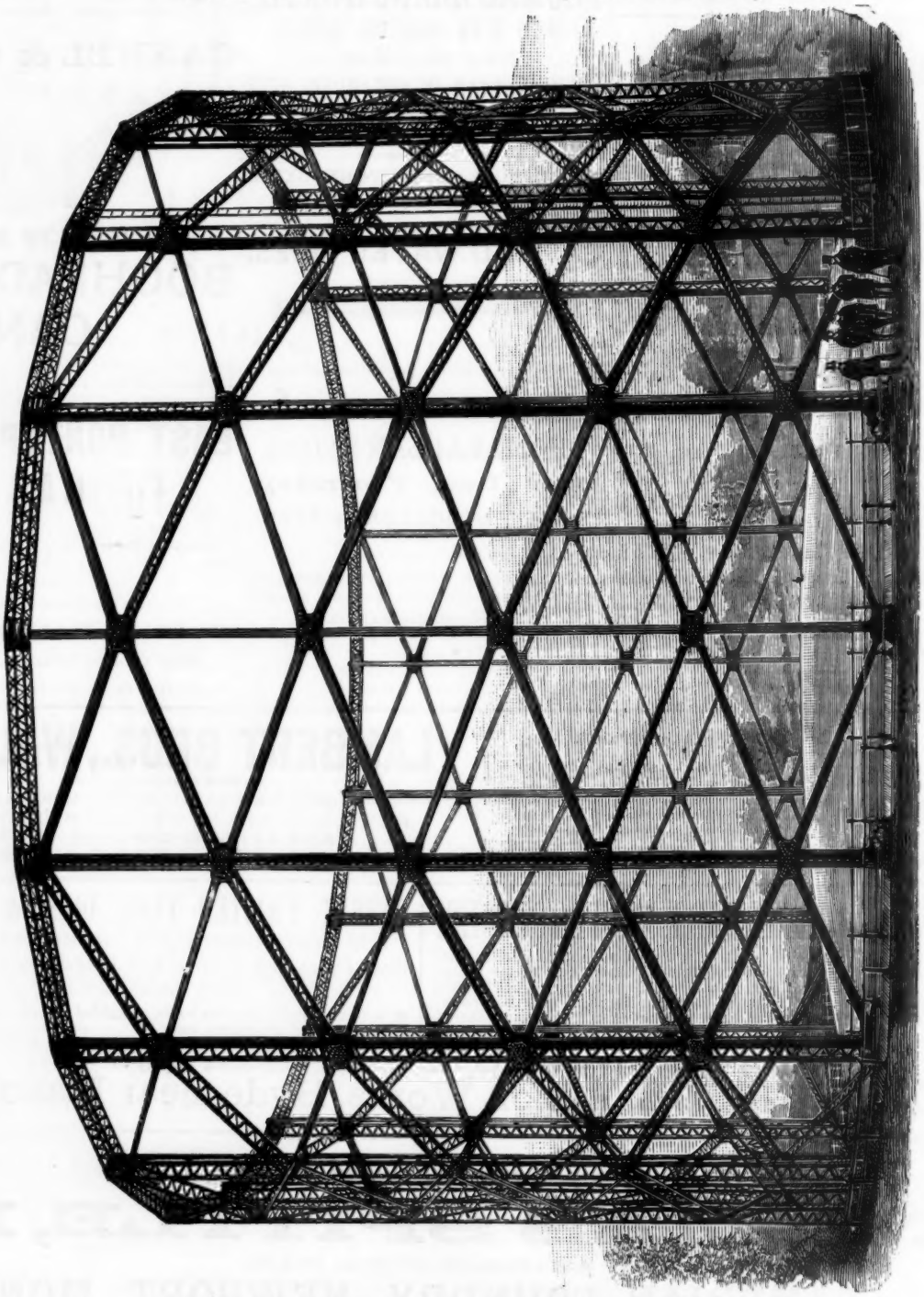
MESSRS. S. CUTLER & SONS, Engineers,

GREAT GEORGE STREET CHAMBERS,

16, GREAT GEORGE ST., WESTMINSTER, S.W.

WORKS: MILLWALL, LONDON, E.

Cutler's Spiral Guide-Framing for Gasholders.



Tunbridge Wells Gas-Works—Cutler's Patent Guide-Framing—Erected 1889.

STRONG. — SAFE. — CHEAP.

Most advantageous Disposition of Material.

Economical both in Manufacture and Erection; and by avoiding the necessity for large Piers, permitting considerable Economy in the Construction of the Tank.

JAMES D. PERKINS. F. SEAVERNS.

PERKINS & Co.,

228 & 229, PRODUCE EXCHANGE, NEW YORK.

Cable Address: "PERKINS, NEW YORK." *Post Office Box 3695, New York.*

SOLE AGENTS FOR THE CELEBRATED

BRECKENRIDGE CANNEL

AND THE

OLD KENTUCKY BOGHEAD

OF KENTUCKY, U.S.A.

These Cannels will rank with the Australian Shale for Gas Manufacture.

Also General Sales Agents for

PENNSYLVANIA GAS COALS AND AMERICAN FOUNDRY & FURNACE COKE.

Delivery Prices made to any Port in

GREAT BRITAIN, ON THE CONTINENT, OR SOUTH AMERICA.

Full Information furnished upon Application to the above Address.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE STREET, BIRMINGHAM—AGENT: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.

LIMITED,

Room 446—11, QUEEN VICTORIA STREET,

LONDON, E.C.,

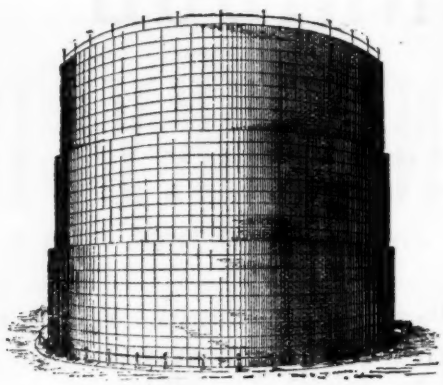
Where Price Lists and full particulars may be obtained.

REVOLUTION
IN GASHOLDER CONSTRUCTION.
(GADD & MASON'S PATENTS.)

IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.

NO COLUMNS. NO FRAMING
NO COLUMNS. NO FRAMING.
NO COLUMNS. NO FRAMING.

NO PIERS ROUND TANK.
NO PIERS ROUND TANK.
NO PIERS ROUND TANK.



IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.

NO COLUMNS. NO FRAMING.
NO COLUMNS. NO FRAMING.
NO COLUMNS. NO FRAMING.

NO PIERS ROUND TANK.
NO PIERS ROUND TANK.
NO PIERS ROUND TANK.

GREATER STABILITY. TILTING IMPOSSIBLE.

Tank Construction rendered far simpler and very much cheaper; the Piers and heavy Base Stones being dispensed with.

In Holders for Export a very large additional saving is effected in Carriage, Freight, Transport, and Insurance; the weight being reduced nearly **50 per cent.**

Admitted by eminent Engineers to be the system of the future.

Our Alternative Arrangements of Torsional and Tensional Gearing **WE DO NOT RECOMMEND.** The former, by means of Geared Shafting, or Rack and Pinion, **IS CLUMSY**; whilst the latter, by means of Chains or Ropes, **IS UNRELIABLE AND DANGEROUS.**

Engineers intending to extend their Gas Storeage should not fail to see the TWO-LIFT HOLDER erected for the Northwich Gas Company.

PLANS, SPECIFICATIONS, AND ESTIMATES SUPPLIED.

Telegrams: "SPIRAL MANCHESTER."

The PATENT GASHOLDER SYNDICATE,
504, STOCKPORT ROAD, MANCHESTER.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected, including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

RETORT SETTINGS IMPROVED

BY ADOPTING

THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.

HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

J. & H. ROBUS,

CONTRACTORS FOR GAS AND WATER WORKS,
20, BUCKLERSBURY, LONDON, E.C.

BELL'S ASBESTOS AQUOL PAINT

BELL'S ASBESTOS

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

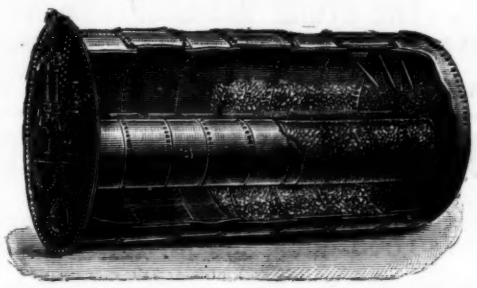
BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

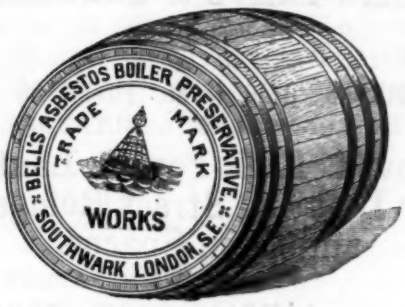
DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN, BARCELONA, and ANTWERP.

BELL'S ASBESTOS BOILER PRESERVATIVE

Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



Every Cask is sent out as above.

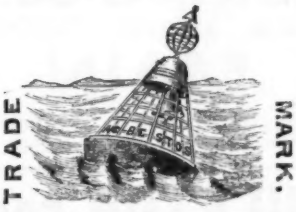
The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED—A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
DUBLIN, BERLIN.



DEPÔTS.

BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
CARDIFF: West Bute Street.
BARCELONA, and ANTWERP.

SOUTHWARK, BELL'S ASBESTOS. **LONDON, S.E.**

BELLS ASBESTOS

YARN AND SOAPSTONE PACKING

Is the BEST LOCOMOTIVE PACKING made.

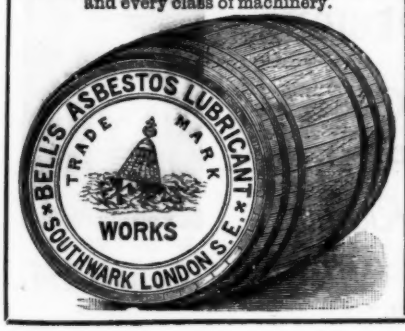
BELL'S

COMPOUND HYDRAULIC PACKING

Is specially suited for
Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT

Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE

The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

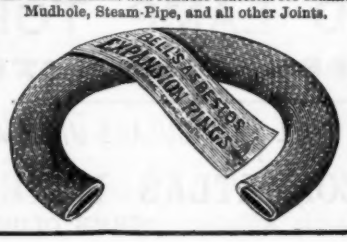
Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS

EXPANSION SHEETING

RINGS, AND TAPE.

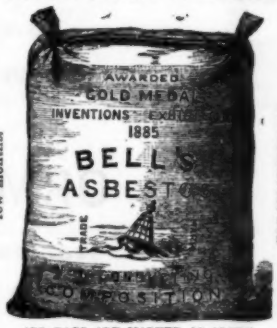
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



BELL'S ASBESTOS

NON-CONDUCTING COMPOSITION.

Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



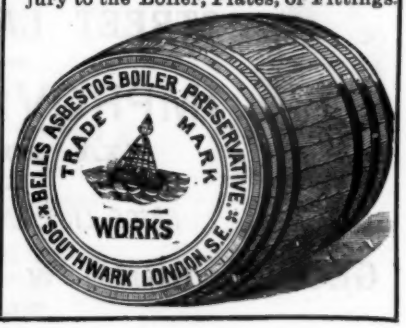
Can be applied again after many years' service. Is sent out dry in bags: therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS

BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



S. PONTIFEX & CO.,

GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERN COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT

LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

TO LAMP MAKERS.

General Metal Spinners to the Trade,
Gas-Lighting and Ventilating Engineers.

THE ÉTOILE GAS-LAMP COMPANY,

124 & 126, PRINCESS ST., **MANCHESTER.**

N.B.—See Advertisement last week (p. 410) and next week.

OXYGEN, OXYGEN, OXYGEN.

(Extracted from the Atmosphere by Brin's Patent Process.)

40,000 cubic feet always in Stock.

Managers of Gas-Works supplied with Oxygen compressed in Weldless Steel Cylinders, for experimental purposes, &c., at special rates.

Estimates given for the erection of Oxygen Producers in Gas-Works, &c.

Managers of Gas-Works specially invited to inspect our Works.

The Manchester Oxygen (BRIN'S PATENT) Co., Ltd.,

GREAT MARLBOROUGH ST., OXFORD ROAD,

MANCHESTER.

Manufacturers and Compressors of all kinds of Gas.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

ORME'S GAS REGULATOR FOR STREET LAMPS

No. 200.
LAMP REGULATOR
Full Size.

(Behl's Patent)

Adopted by the leading GAS COMPANIES AND CORPORATIONS.

More than 150,000 now in use.

Strongly made, all Brass, as Illustration No. 200,

Price, 24/- per dozen.

ORME'S GAS REGULATOR

(BEHL'S PATENT),

No. 201, 202, 203, FOR DOMESTIC USE,

Saves from 20 to 50 per cent. of Gas.

Gives a bright and steady Light.

Price, 15/- per dozen.

SAMPLES UPON APPLICATION.

No. 201, ⅜ B Socket.
„ 202, ½ B Socket.

No. 203 Taper Screw.

STREET LANTERNS OF NEW DESIGNS.

IMPROVED LAMP TORCHES.

ALL BRASS. EXTRA STRONG.

PRICE LIST AND FULL PARTICULARS UPON APPLICATION.

GEORGE ORME & CO., ATLAS METER WORKS, OLDHAM.

Telegraphic Address: "ORME OLDHAM."

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

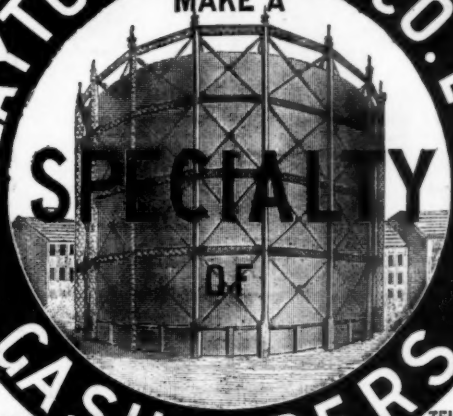
ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET,
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A



SPECIALTY OF GASHOLDERS

AND MAKERS OF

REG^D TELEGRAPHIC ADDRESS:
"GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.

Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

MOBBERLEY & PERRY,

Fire-Brick Works, STOURBRIDGE.

☞ **Retort Setters sent to any part of the Kingdom.**

STREET-LAMPS,

ORDINARY OR

OUR SPECIAL HIGH-POWER.

The best Lamps in the Trade.

Street-Lamp Governors. Gas-Meters.

HULETT'S

SERVICE CLEANSER.

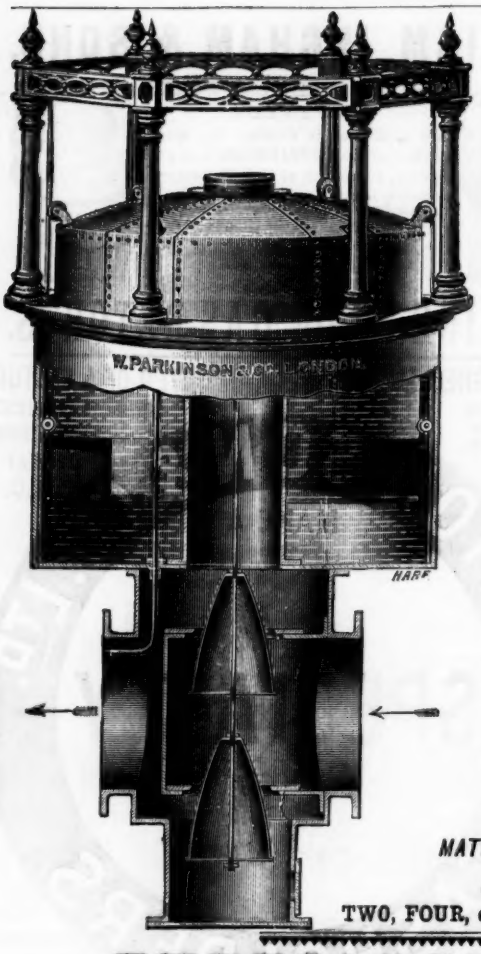
No Gas Company should be without this Apparatus.

THOUSANDS IN USE.

Every Description of Gas-Fittings, Pressure-Gauges, &c.

D. HULETT & CO., LIMITED,

55 & 56, HIGH HOLBORN, LONDON.



PARKINSON'S
IMPROVED
EQUILIBRIUM GOVERNOR.

This Governor combines all the advantages of simplicity with perfect efficiency. It effectually overcomes the difficulty of varying pressures experienced by many Engineers owing to the change of light and heavy gasholders, and other causes.

Two parabolic cone valves are employed, one fitted above the other, as shown in the Engraving. By this means the flow of gas is divided, and passes equally through the valves, which are in perfect equilibrium, whatever position they occupy.

No "compensating arrangements" are therefore needed; no attention is required; and the management of the Governor is made as simple as it possibly can be.

In actual practice this Governor is found to be perfect in its action; and every detail in construction is carried out with the utmost care.

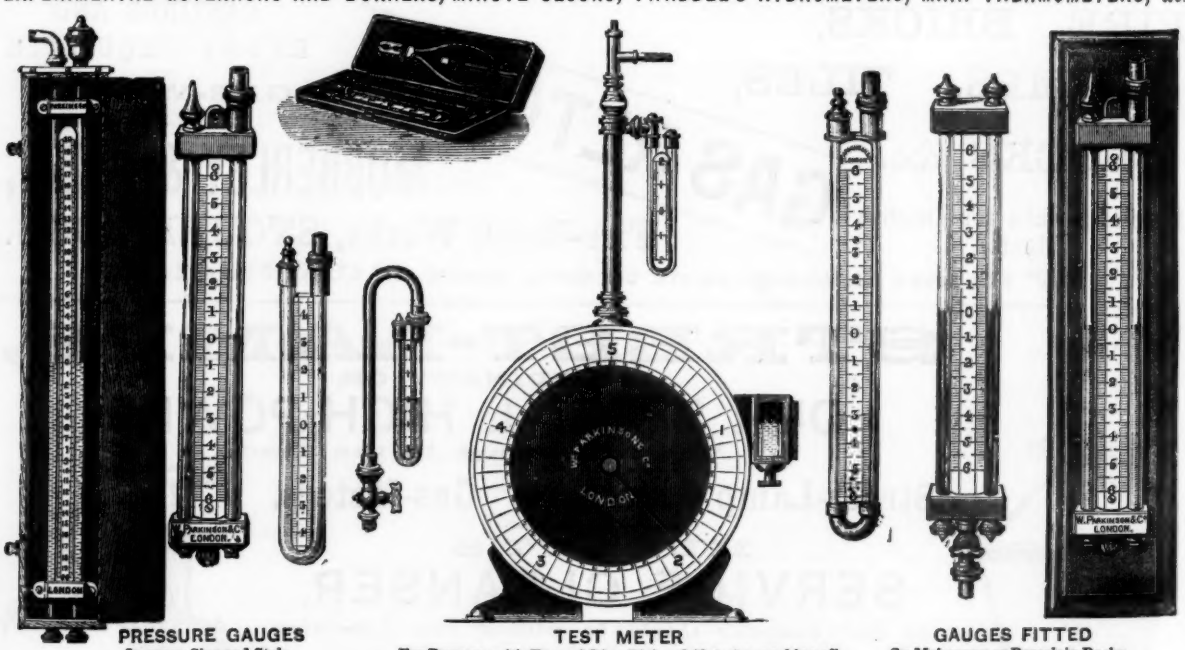
MATERIALS AND WORKMANSHIP OF THE VERY BEST QUALITY.

COUNTERBALANCE or AIR VESSEL, as desired.
TWO, FOUR, or SIX COLUMNS and GIRDERS.—WEIGHTS or WATER PRESSURE.

EXPERIMENTAL APPARATUS.

TEST METERS { For Official Inspectors and others, fitted with Parkinson's Patent Three-partition Drums. A 100-light Meter has recently been made for the City of London Corporation, and Stamped by the Board of Trade as a Standard Instrument.

SULPHUR-TEST METERS, KING'S GAUGES, PHOTOMETERS;
EXPERIMENTAL GOVERNORS AND BURNERS, MINUTE CLOCKS, TWADDEL'S HYDROMETERS, MAIN THERMOMETERS, &c.



PRESSURE GAUGES
In every Size and Style.

TEST METER
For Burners, with Enamel Ring Dial and Slate for marking off. A most useful and necessary Instrument for every Gas Manager.

GAUGES FITTED
On Mahogany or Porcelain Backs or in Polished Wood Cases.

GOLD & SILVER MEDALS, Health Exhibition, London, 1884. SILVER MEDAL, Inventions Exhibition, 1885.

FULL PARTICULARS AND PRICE ON APPLICATION TO

W. PARKINSON & CO., GAS ENGINEERS, COTTAGE LANE WORKS, CITY ROAD, LONDON.

Telegraphic Address: "INDEX LONDON."

[See also Advt., p. 428.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, March 11, 1890.